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Commonwealth of Massachusetts
Metropolitan District Commission

COMBINED SEWER OVERFLOW PROJECT

Progress To Date Report

SEPTEMBER 1979

CAMP DRESSER & McKEE INC.

OCT 15 1979

Commonwealth of Massachusetts
Metropolitan District Commission

COMBINED SEWER OVERFLOW PROJECT

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SEPTEMBER 1979

CAMP DRESSER & McKEE INC.

CDM

environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & McKEE INC.

One Center Plaza
Boston, Massachusetts 02108
617 742-5151

28 September 1979

Mr. John R. Elwood
Supervising Sanitary Engineer
Environmental Planning Office
Metropolitan District Commission
20 Somerset Street
Boston, Massachusetts 02108

Combined Sewer Overflow Project
<u>Progress To Date Report</u>

Dear Mr. Elwood:

We are pleased to submit this Progress To Date Report on the Combined Sewer Overflow Project. This report summarizes the work performed in the four planning areas, from the project start in June 1978 through the conclusion of the screening of alternatives phase in August of this year. We describe the objectives of CSO control in the four planning areas and analyze the results which led to the development of these objectives. We also describe the alternatives selected for detailed evaluation and the work which lies ahead in the detailed evaluation phase and in the selection of CSO control plans.

This report has been prepared in accordance with our contract dated 11 May 1978 and twenty-five (25) copies are enclosed. We trust that you will find the report complete and ready for transmittal to the state and federal regulatory agencies.

Very truly yours,

CAMP DRESSER & McKEE INC.

William F. Callahan

William F. Callahan
Senior Vice President

WFC/j
cc: Mr. Thomas F. Cheyer

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1. SUMMARY

The Metropolitan District Commission (MDC) is in the fifteenth month of a two-year planning study for combined sewer overflow (CSO) control in the communities of Boston, Brookline, Cambridge, Chelsea, and Somerville. The planning area exceeds 50 square miles; the number of CSO discharges exceeds 100; and Boston Inner Harbor, the Charles River Basin, the Neponset River Estuary and Dorchester Bay are the principal receiving waters.

Most of the CSO discharges are from the community combined sewer systems, and most of the CSO outlets are owned by the communities. However, the MDC is involved in the planning for CSO control because of the impact of CSO pollution near MDC beaches and other recreational areas.

The planning work is being performed in six phases:

1. field investigations
2. assessment of existing and future no-action conditions
3. screening of alternatives
4. detailed evaluation of alternatives
5. plan selection
6. preliminary design.

The third phase has been completed -- objectives for CSO control have been established, and feasible alternatives to accomplish these objectives have been selected. In the first phase, six months of field investigations resulted in the characterization of CSO and stormwater quality and quantity, measurements of receiving water quality and the identification of operational problems in the combined sewer collection systems.

In the second phase, computer models were used to simulate longterm average loadings of CSO and stormwater, and storm event loadings of CSO. Receiving water models were developed to demonstrate long term water quality impacts. In the third phase, CSO control technologies were screened for their application to specific planning area situations. A range of CSO control levels was analyzed, from no-action to storage of the 1-year 6-hour storm and greater storm events. Objectives were established based on three factors:

1. Water quality standards and public concerns.

2. Water quality impacts of different CSO control levels.

3. Cost estimates for the application of CSO control technologies at the different levels of control.

Major results of the work to date are listed below.

1. The combined sewer overflows have acute short term public health impacts, as measured by coliform bacteria, and short term aesthetic impacts, as measured by floating materials. These short term impacts occur after significant storm events and last only a few days.

2. The combined sewer overflows have chronic long term impacts due to discharges of dry weather flow from combined sewer overflow outlets. These discharges, called dry weather overflow, are caused generally by malfunctioning regulators, tide gate failures, sewer blockages, and illegal sanitary connections to storm drains.

3. At many locations in the harbor and tributary rivers, the elimination of dry weather overflow would result in compliance with the Massachusetts Water Quality Standards.

4. The general objectives of CSO control in the four planning areas are:

   a. Eliminate dry weather overflow through collection system structural and operational improvements.

   b. Characterize the impact of stormwater discharges (urban runoff).

   c. Achieve State Water Quality Standards for coliform for selected design events (except as noted below).

   d. In beach and presently harvestable shellfishing areas, control pathogens to a degree more stringent than the water quality standards, on the order of 0 to 16 coliform violation-days per year.

   e. In the Charles River Basin, provide suspended solids control to minimize the build up of benthic deposits. A level of 80 mg/l suspended solids in the Basin is, under existing conditions, reached during large storm events, and this 80 mg/l level was taken as an acceptable upper limit for suspended solids. In the harbor, suspended solids contributed by CSO are not considered to be significant.

5. The incremental cost for floatables, oil and grease removal at facilities proposed for CSO control will be identified. An estimate will be made of the cost to provide floatables, oil, and grease removal at CSO discharges judged not to need control based on coliform impacts. Based on these results, there will be further discussions with the regulatory agencies on minimum controls for CSO discharges.

6. Based on results to date, the following State Water Quality Classifications and Standards cannot be met with dry weather overflow and CSO control alone:

   a. Class B in Back Bay Fens
   b. Dissolved oxygen in the Upper Inner Harbor
   c. Class B in Alewife Brook
   d. Class SB total coliform in the Neponset River Estuary and Tenean Beach

7. Certain joint area alternatives involving CSO control solutions for two or more of the four planning areas were found to be more costly than selected decentralized CSO control alternatives.

8. The following CSO control technologies are being evaluated in detail for application in the four planning areas:

   full sewer separation
   partial sewer separation
   separation plates (in dual manholes)
   insystem modifications (piping and regulator modifications)
   regulator (positive closure) improvements
   automatic tide gates
   tide gate improvements
   street sweeping
   catch basin cleaning
   sewer flushing
   sewer cleaning
   flow diversion to a less sensitive receiving water
   insystem pumping to increase sewer capacity
   surface storage
   off-line storage
   in-line storage
   detention
   conventional disinfection
   high rate disinfection
   screening
   grit removal
   swirl concentrators

2. INTRODUCTION

In June of 1978, the Metropolitan District Commission of the Commonwealth of Massachusetts initiated its Combined Sewer Overflow Project with the start of engineering and planning studies for combined sewer overflow control in four planning areas--Boston's Inner Harbor, the Charles River Basin, Dorchester Bay, and the Neponset River Estuary. These studies are scheduled to end in 1980 with the development of facilities plans in fulfillment of the requirements of the Massachusetts Division of Water Pollution Control and the U.S. Environmental Protection Agency construction grants programs.

Most of the combined sewers, regulators and CSO outles are owned by the communities in the project area. The present ownership of active existing CSO outlets (not including regulating devices) is given below:

Metropolitan District Commission	8
City of Boston	71
Town of Brookline	2
City of Cambridge	13
City of Chelsea	4
City of Somerville	10
Total	108

The MDC's interest in CSO control is due to the impact of CSO pollution near MDC beaches and other recreational areas. Additionally, the communities' combined sewers cause at certain times high wet weather flows and operational problems in the MDC interceptor system.

The engineering and planning in the four areas is being performed by the following consultants, referenced henceforth as area consultants:

Boston Inner Harbor	O'Brien & Gere, Inc.
Charles River Basin	Metcalf & Eddy, Inc.
Dorchester Bay	Camp Dresser & McKee Inc.
Neponset River Estuary	Havens & Emerson, Inc.

Camp Dresser & McKee is also the lead consultant for the project, and in this role assists the Metropolitan District Commission with project management and technical review and coordination.

Purpose and Scope of this Report

This report describes, through summary and analysis of results, the progress to date in the four planning areas. Three phases of the project have been completed. These are:

1. Field Investigations
2. Assessment of Existing and Future No-Action Conditions
3. Identification and Screening of Alternatives

These three phases culminated in the establishment of CSO control objectives and the selection of a limited number of feasible alternatives for detailed evaluation, which are described herein.

Three more phases of the project remain:

4. Detailed Evaluation of Alternatives
5. Plan Selection
6. Preliminary Design

The detailed evaluation of alternatives is presently underway. The Progress To Date Report has been prepared at this time in order that the regulatory agencies may review the objectives and selected alternatives, and then formally comment on them during the detailed evaluation phase.

Facilities Plan Report Draft Chapters

In addition to the summary provided in this report, draft chapters from the area consultants' facilities plan reports are also being submitted. These draft chapters cover the engineering/planning work and environmental assessment work completed to date. The engineering/planning chapters describe:

- general design criteria
- existing facilities
- dry weather flows
- wet weather flows
- combined sewer modeling
- Charles River Basin water quality modeling*
- assessment of existing and future no-action conditions
- screening of alternatives

The environmental assessment chapters describe:

- affected environment
- environmental impact comparison of alternatives screened
- environmental consequences of the no-action alternative and alternatives screened.

The lead consultant and the MDC have previously reviewed and commented on these chapters, with the exception of those chapters describing the screening of alternatives which are currently being reviewed. Area consultants were requested to update their previous chapters in response to the previous comments for this submittal. The draft chapters are included in Appendix A. Also in that appendix, there is a full report outline which shows the proposed organization of all chapters in the facilities plan reports.

*Boston Harbor Modeling Report to be prepared at a later date.

3. PLANNING AREAS DESCRIPTION

This section presents a general description of the planning areas, their receiving waters, and collection system characteristics.

Planning Areas

The CSO Project encompasses the four planning areas proposed in the EMMA Study of 1976. Figure 1 shows the four areas whose total area is about 51 square miles. The Charles River Basin area is the largest, with 23,000 acres, followed in descending order of size by the Inner Harbor area, 5,900 acres, the Dorchester Bay area, 2,900 acres, and the Neponset River Estuary area with 1,100 acres. Table 1 presents information on land use in each area.

Receiving Waters

The EMMA Study delineated these planning areas primarily based on receiving water quality issues and priorities for CSO control. Each planning area's receiving waters are described below. Massachusetts water quality classifications are indicated in parenthesis, and these do not necessarily indicate present quality.

- Dorchester Bay (Class SB)......the primary water contact recreation area of Boston Harbor, with five beaches, seven yacht clubs, 60 acres of moderately contaminated shellfish harvesting areas, and 240 acres of presently closed shellfish harvesting areas.

- Charles River Basin (Class C, except Class B in the Back Bay Fens and Alewife Brook).....the most visible water resource in the Boston area, including the Basin proper, the Back Bay Fens, the Basin parkways, the green belt stretching to Arnold Arboretum and Franklin Park, and Alewife Brook.

- Neponset River Estuary (Class SB).....the longest estuary tributary to the harbor, including three yacht clubs, and having presently restricted shellfish harvesting areas.

- Boston Inner Harbor (Class SC, except SB near Constitution Beach).....the commercial and shipping area, having at present the poorest water quality in the CSO project area, but also witnessing intensive waterfront renewal and residential and commercial development; and having one beach, Constitution Beach, which is separated from the shipping channel by Logan Airport.

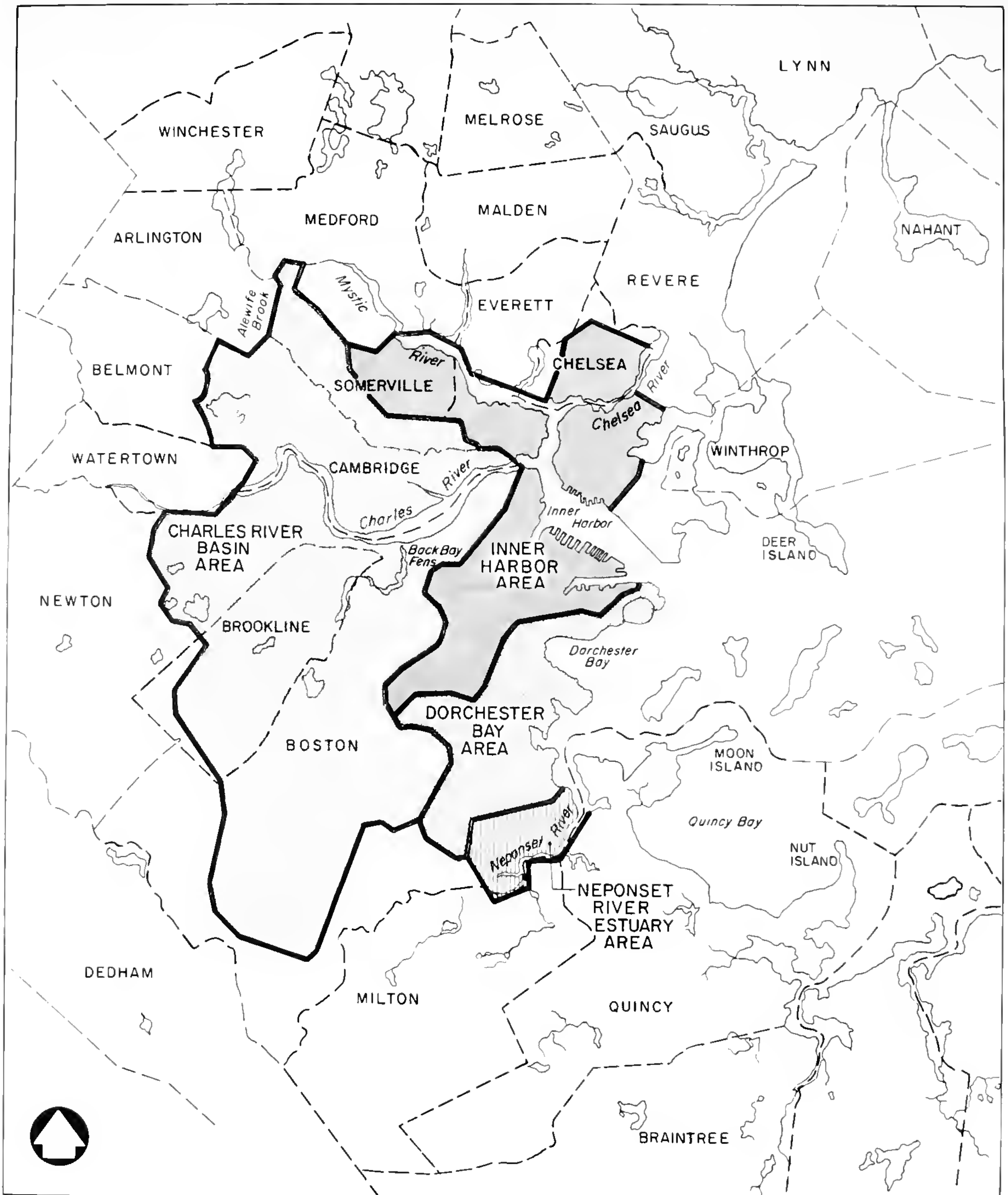

FIG. 1 COMBINED SEWER OVERFLOW PROJECT PLANNING AREAS.

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TABLE 1. PLANNING AREA LAND USE DATA (Acres)

LAND USE TYPE	CHARLES RIVER BASIN	INNER HARBOR	DORCHESTER BAY	NEPONSET RIVER ESTUARY	TOTALS
Residential	13,100	2,600	1,700	650	18,050
Commercial/ Institutional	2,600	1,000	500	150	4,250
Industrial	2,600	1,700	100	50	4,450
Open Space	4,700	600	600	250	6,150
TOTAL AREA	23,000	5,900	2,900	1,100	32,900

Collection System Characteristics

The total CSO project area covers 51 square miles, of which approximately 20 square miles are served by combined sewers. Table 2 presents data on the collection systems and combined sewer overflows identified. There were 108 CSO outlets and 236 regulating and control structures identified.

When the area consultants began to assess the existing combined sewer overflow situation -- the existing problems and the opportunities for control -- they found the problems and control opportunities to be widely dispersed geographically. Therefore, the four planning areas were further subdivided for analysis based on collection system characteristics, existing problems and issues, and opportunities for CSO control. As a result of this subdivision, there are 14 subareas for which analysis and planning have been performed. The subareas are identified below:

Planning Area	Subareas
Charles River Basin	Charles River Estuary Cottage Farm Stony Brook/Back Bay Fens Muddy River Allston-Brighton Alewife Brook
Inner Harbor	Boston Proper/South End South Boston Somerville/Charlestown Chelsea/East Boston
Dorchester Bay	South Boston Dorchester
Neponset River Estuary	Port Norfolk Granite Avenue

In addition to the analysis of subareas, joint area alternatives which spanned two or more planning areas were analyzed. The study areas for joint area alternatives are described in Section 4.F.

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TABLE 2. PLANNING AREA COLLECTION SYSTEM CHARACTERISTICS

PLANNING AREAS	CHARLES RIVER BASIN	INNER HARBOR	DORCHESTER BAY	NEPONSET RIVER ESTUARY	TOTAL PROJECT AREA
Area (acres)	23,000	5,900	2,900	1,100	32,900
Combined Sewer Service Area (%)	28	78	48	25	39
Separate Sewer Service Area (%)	52	13	36	53	43
Unsewered Area (%)	20	9	16	22	18
Active CSO Outlets Identified	42	52	11	3	108
CSO Regulators and Control Structures Identified (upstream of outlets)	132	65	34	5	236
Separate Storm Drain Outlets Identified *	7	19	5	8	39

*Included are those storm drains previously identified with a NPDES permit number

4. ENGINEERING AND PLANNING ACTIVITIES

This section discusses the different types of engineering and planning activities performed to date:

- field investigations
- combined sewer system modeling
- receiving water modeling
- environmental assessment
- other engineering analyses
- public participation

The discussion of these activities includes their purpose, scope and key results. The results were inputs to the screening of alternatives phase, which is described in Section 5.

These activities were performed individually by the four area consultants, and coordinated by the lead consultant. In preface to the discussion of the area consultants' activities, the role of the lead consultant is described.

A. ROLE OF THE LEAD CONSULTANT

The lead consultant assists the MDC with project management and technical review and coordination functions. Project management activities have included the development of and updating the project schedule, conducting meetings of the consultants--21 group meetings to date, and many more individual meetings--and the review of area consultants' bimonthly progress reports and preparation of summary progress reports.

The technical review and coordination functions are carried out by guidelines and review of interim results and draft reports, which are described below.

Guidelines. Guidelines were prepared to give scope, direction and consistency of approach to several activities. To date, guidelines have been prepared in eleven areas:

- sewer monitoring and sampling
- population and water consumption
- combined sewer system modeling
- design criteria
- facilities plan report format
- environmental assessment
- methodology for CSO control alternative screening
- cost estimating
- CSO residual solids handling and disposal
- legal and institutional analyses
- public participation

Each of the guidelines is briefly described below.

- Sewer Monitoring and Sampling. These guidelines outlined procedures for sewer sampling and gaging based on a review of the field programs proposed by the area consultants. A core group of parameters were defined for characterization of CSO, including coliform, BOD and suspended solids. Heavy metals, nutrients, pesticides and other pollutants were to be investigated to the extent that they were significant in the planning areas.

  Part of the guidelines work included establishing a program of quality assurance in field and laboratory analysis techniques. The EPA Region I Quality Assurance Section provided assistance in developing the scope of that program.

  The field investigations were performed based on the guidelines, and these investigations and their results are described in Section 4.B.

- Population and Water Consumption. An evaluation was made of several current population projections for the CSO Project area and of the water consumption data available. The result of this evaluation was the determination of a common data base for present and projected populations in the four planning areas. The planning period was established as the years 1985 to 2005. The 1975 State Census is being used for present populations, and projections established by the Central Traffic Planning Staff for the MAPC Areawide Wastewater Management Plan are used for projections. Water supply figures based on MDC supply records were used as the common starting point for developing planning area water consumption and return flow estimates.

- Combined Sewer Modeling. These guidelines structured the programs for the land-side modeling and initiated the coordination of the land-side combined sewer modeling with the receiving water modeling. Design hydrology was established, including the source of rainfall data, the definition of the long-term historic record (May 1948 to December 1976 or its statistical equivalent), and the technical method for development of water quality design storms. The design storms may differ among planning areas, based on planning area objectives. Also established in the guidelines were groundrules for sewer model network geometry and catchments, land use classifications, and hydrologic, hydraulic and water quality parameters.

  The combined sewer modeling program and its results are described in Section 4.C.

- Design Criteria. Guidance on design criteria is an ongoing function. Rather than developing general criteria for all four planning areas, the lead consultant has coordinated certain criteria developed by the area consultants. The area consultants' criteria are based on site specific applications in their planning areas. The coordination of these planning area criteria is intended to lead to compatible overall designs throughout the project, but not necessarily identical criteria.

Much of the design criteria coordination remains to be performed during the detailed evaluation and preliminary design phases. To date, coordination has been initiated on criteria for separate storm drainage, street sweeping, and minimum control of floatables, oil and grease.

- Facilities Plan Report Format. These guidelines established the overall organization and outline for the facilities plan reports. Separate facilities plans will be prepared for each planning area, and the reports will include an Engineering Report and an Environmental Assessment Report. The schedule and content of interim draft chapter submittals was also developed.

- Environmental Assessment. These guidelines set procedures for the definition of environmental issues and assessment methodology. An Environmental Issues identification meeting was held with the regulatory agencies, and three meetings of the environmental assessment groups were held where interim results were discussed. The guidelines also provided terminology, screening matrix format, and a uniform list of standards and criteria for environmental pollutants.

  The environmental assessment reports are being prepared in the format required for environmental documents under the current Council on Environmental Quality and EPA regulations. The results of the environmental assessment work to date are described in Section 4.E.

- Methodology for CSO Control Alternative Screening. This document established the basic methodlogy for identifying the range of CSO control levels, and described the use of modeling results to select control objectives. This methodology was an important part of the screening of alternatives phase, and it is discussed in detail in Section 5.

- Cost Estimating. These guidelines presented detailed procedures and established the level of detail for doing the cost-effectivness analysis of selected alternatives. Among those things established in the guidelines were: the ENR construction cost index, the discount rate, certain unit prices for annual expenses (energy, chemicals, labor), presentation and breakdown of costs, allowances for engineering and contingencies estimates, salvage values and useful lives of facilities. The cost of wet weather flow treatment at Deer Island was preliminarily established for initial cost estimates for diversion of wet weather flow to the interceptor system and for dewatering storage tank after storms. This cost will be refined based on the results of the alternatives evaluation.

- <u>CSO Residual Solids</u>. These guidelines outlined an approach to analyzing alternatives for CSO residual solids handling and disposal. The approach in the guidelines assumes that control of the CSO liquid, and its environmental impacts, are the primary concerns and that residual solids disposal alternatives would not significantly affect the overall planning. Therefore, the guidelines state that during the detailed evaluation phase, the area consultants will investigate the feasibility of disposal of CSO solids to the interceptor system (grit and screenings by truck to a landfill) as is presently done at the Cottage Farm Chlorination and Detention Station and planned for the Charles River Estuary Chlorination and Detention Facility. Solids quantities and characteristics will be estimated, and the lead consultant will review the total solids quantity and its impact on the treatment plant.

  During the preliminary design phase, other solids disposal alternatives, including joint area alternatives, will be considered, if it appears that disposal to the interceptor system may not be feasible or most cost-effective.

- <u>Legal and Institutional Analyses</u>. These guidelines are being developed in response to specific institutional and legal issues identified. Several issues common to one or more planning area were identified by the lead consultant during the review of alternatives for CSO control which the area consultants were considering. These issues included construction on parkland and beaches, acquisition of public vs private land for facilities, the legality of combined sewer construction, the authority of the MDC, and ownership of facilities. The lead consultant performed a review of the legislation and prepared an interim report on the above-noted issues. The area consultants will further identify legal and institutional issues to be addressed prior to selection of a plan.

  The legal and institional work and future implementation and financing work is further described in Section 6.

- <u>Public Participation</u>. These guidelines set the scope of the public participation programs for the four planning areas. The program features:

  - mailing list
  - public meetings
  - newsletters
  - Citizens Advisory Committee (CAC)
  - CAC Subcommittees
  - public hearings

  Since developing the guidelines, the lead consultant has maintained an active role in managing the public participation program. The program is further described in Section 4.G.

Reviews. Review of interim results and draft facilities plan reports chapters is another coordination function of the lead consultant. The area consultants were requested to submit descriptions of their versions of combined sewer models, and these were reviewed for compatibility. Lists of parameters used for modeling by the area consultants were reviewed during initial model calibration for consistency in parameters. The combined sewer overflow and separate storm drainage loads developed for modeling harbor impacts were reviewed and compared to unit area loadings developed in other studies. Harbor modeling results were reviewed, and additional information requested on impacts. Dry weather flows were reviewed for their overall flow balance in the interceptor system. Also, the alternatives selected for detailed evaluation were reviewed for compatibility between planning areas.

During the reviews of draft chapters, comments were prepared to formally document the text review and the previous review of interim results presented in the draft chapters. Draft chapter reviews have been performed for the chapter submittals on the following dates:

February 28, 1979..........Engineering Report
- General Design Criteria
- Existing Facilities

Environmental Assessment Report
- Affected Environment

March 21, 1979.............Engineering Report
- Dry Weather Flows
- Wet Weather Flows

May 31, 1979...............Engineering Report
- Combined Sewer Modeling
- Charles River Basin Modeling
- Assessment of Existing and Future No-Action Situations

Environmental Assessment Report
- Environmental Consequences of the No-Action Alternative

August 31, 1979............Engineering Report
(review underway)
- Screening of Alternatives

Environmental Assessment Report
- Comparison of Alternatives Screened
- Environmental Consequenses of Alternatives Screened

Section 6 describes the lead consultant's role and upcoming work in the detailed evaluation, plan selection, and preliminary design phase.

B. FIELD INVESTIGATIONS

This section describes the area consultants' combined sewer system and receiving water monitoring and sampling programs. The results of these programs were inputs to the modeling activities, described later in Sections C and D, from which conclusions were drawn on CSO and stormwater loadings and their water quality impacts.

Purpose and Scope

The field investigations were performed to gather and to supplement existing data from previous studies. To date, the following types of field investigations have been made:

- inspection of the collection system and existing CSO facilities
- dry weather flow gaging and sampling
- dry weather overflow identification (including dye tests)
- raingaging
- combined sewer overflow gaging and sampling
- stormwater sampling
- harbor surf zone sampling
- Mystic, Chelsea, and Neponset rivers dissolved oxygen surveillance
- Charles River Basin sampling and time of travel studies
- Back Bay Fens and Alewife Brook sampling
- shellfish sampling
- sediments sampling

Subsurface soil borings and preliminary site surveys will be performed at proposed sites during the preliminary design phase, if necessary.

Results

Results of the field inspections of CSO outlets and regulators are presented in Appendix B in the form of an updated list of CSO and stormwater outlets in the four planning areas.

Dry Weather Flow, CSO and Stormwater. Dry weather flow data were collected between the months of August and November in 1978. Many storm events were monitored in one or more of the planning areas, and Table 3 shows the number of different storm events on which data were gathered. Storm event monitoring equipment was in place between July and November of 1978, in January of 1979, and between March and September of 1979.

Typical characteristics for dry weather flow, CSO and separate storm drainage are given in Table 4. Coliform concentrations vary greatly among the planning areas and at different points in the planning areas.

Nutrients (phosphorus and nitrogen compounds) were found not to be significant in CSO compared to the other sources of stormwater and river flows. Nutrients and heavy metals are further discussed below under the Receiving Waters section.

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TABLE 3. STORM EVENTS MONITORED

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
July* 1978																															
August	●	●				●	●	●																							●
September											●	●							●												
October	●			●		●	●						●	●					●								●				
November																	●	●													
January 1979								●																●							
March							●																		●						
April		●							●																						
May			●									●		●						●			●	●	●				●		
June					●						●							●													
July																															
August																															
September						●								●																	

*Equipment in place, but no event monitored

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TABLE 4. TYPICAL CHARACTERISTICS OF DRY WEATHER FLOW, COMBINED SEWER OVERFLOW AND STORMWATER

The values indicated are based on data obtained during the project by the area consultants.

	DRY WEATHER FLOW	COMBINED SEWER OVERFLOW	STORMWATER
Definition	Retained in the collection system	Overflows from the collection system in wet weather	Urban runoff not mixed with sanitary wastewater
Parameters			
Total Coliform (MPN/100 ml)	23 to 275 x 10^6	2 to 20 x 10^6	10^5 to 10^6
BOD (mg/l)	165 to 300	25 to 75	15 to 30
Suspended Solids (mg/l)	130 to 300	50 to 130	50 to 150

Dry Weather Overflow. Early harbor modeling results showed that dry weather overflow was a significant source of coliform, especially in the Inner Harbor area. Special effort was made to identify the locations and magnitudes of dry weather overflow discharges. Over all of the four areas, about 24 million gallons per day of dry weather overflow was estimated to be discharging. The Boston Water & Sewer Commission and the city of Somerville were notified of the locations, and some correction of the problems was made. Specific recommendations for dry weather overflow mitigation will be a part of each facilities plan.

Receiving Waters. The results of previous sampling by others were reviewed, and new measurements were made in receiving waters under dry and wet weather conditions. The harbor surf zone was sampled by the Inner Harbor consultant on 12 surveys at 8 locations:

1. Quincy Bay
2. Winthrop Harbor
3. East Boston Pier No. 1
4. Pleasure Bay
5. L Street Beach
6. Carson Beach
7. Malibu Beach
8. Tenean Beach

These surf samples were grab samples analyzed for temperature, salinity, dissolved oxygen, total and fecal coliform, suspended solids, heavy metals and PCBs.

The Mystic River, Neponset River, and the Chelsea River were sampled by the Inner Harbor consultant at several sites for 5 days following the storm of September 11 and 12, 1978. The primary concern in this survey was to identify any dissolved oxygen depression. Dissolved oxygen below the 6.0 mg/l standard was noted in the Mystic and Chelsea Rivers.

The Mystic River above the Amelia Earhart Dam was not modeled, but its water quality was sampled on three occasions in Medford and Somerville during dry weather in order to obtain a background estimate of flow quality into the Inner Harbor.

The Charles River Basin and Alewife Brook were sampled by the Charles River Basin consultant. Time of travel studies were also performed in the Basin. Dorchester Bay sediments were sampled by the Dorchester Bay consultant, and shellfish and sediments in the Neponset Estuary were sampled by the Neponset area consultant. Overall results of all of the receiving water sampling are given below:

- Coliform was found to die off rapidly in the harbor, and somewhat more slowly in the Charles Basin. A decay coefficient of 3 (base e) was used for the harbor and 1 for the Basin. At these rates, within 24 hours, 95 percent of coliform entering the harbor would be naturally eliminated, and 60 percent in the Charles Basin.

- Dissolved oxygen was found to be 4 to 5 mg/l in parts of the Inner Harbor, Mystic and Chelsea Rivers. Borderline violations of the 6.0 mg/l standard were found in the Charles River Basin.

- Suspended solids were found to be most substantially due to river loads.

- Nutrients were found to be occasionally high in parts of the Neponset Estuary and excessive in the Charles Basin and Back Bay Fens. Existing data for the harbor is not adequate to determine if eutrophic conditions exist in Inner Harbor and Dorchester Bay. Sampling in the Charles Basin during April of 1979 showed an apparent increase of nutrients with wet weather events.

- Heavy metals were detected at higher concentrations in sediments near certain CSO outlets in Dorchester Bay than in sediments far away from outlets. In the Charles Basin, heavy metals concentrations were found to increase during wet weather events. In the Neponset Estuary, clam sampling showed some accumulation of cadmium in clam tissues.

As described above, the sampling program showed some correlation between CSO and nutrients and heavy metals in the environment. Nutrients, heavy metals and toxics are pollutants of concern, but the contribution of these strictly from CSO is not large compared to stormwater, treatment plant effluent, and river flows. Control of these pollutants at CSO discharges does not appear to be warranted, instead source controls should be used to limit their discharge to the environment.

C. COMBINED SEWER SYSTEM MODELING

This section describes the land-side modeling of the combined sewer systems. The combined sewer models were developed based on data obtained during the field investigations. The results of the models were then used as input to the receiving water models described in Section D.

Purpose and Scope

Computer-based mathematical models are being utilized for both long-term simulation and design event simulation of the existing combined system and proposed improvements. Three types of models have been developed:

- Simplified models, which provide long-term average loadings for each planning area, based on several years of rainfall records

- Dynamic models, which provide storm event loadings for specific CSO outlets in each planning area, based on a given design storm

- Unified Interceptor Model, which provides boundary conditions between planning areas, based on selected storm and interceptor system operating conditions

Use and Results of the Models

Simplied Models. The assessment of existing and future no-action conditions and the screening of alternatives was performed using the models S/SWMM and SEMSTORM.

These models are similar, in that both conceptualize a catchment area, its land use characteristics, the total storage provided by the combined sewer system, and the capacity of the interceptors leaving the catchment. The models are driven by hourly rainfall records, and yield estimates of CSO and stormwater quantity and quality and quality as long-term averages. The term "simplified model" applies to the way the models simulate the rainfall-runoff-overflow relationship, which is based on overall catchment area, available land surface and collection system storage, and interceptor capacity.

The results of the simplified modeling for CSO and stormwater loads under existing conditions are presented in Table 5. CSO volumes and suspended solids loads are generally smaller than stormwater loads, except for the Inner Harbor which has very little land area drained by separate storm drainage systems. The coliform and BOD loading of stormwater is below that of CSO. Note, however, that the fecal coliform fraction of total coliform is typically greater in CSO than stormwater. The loadings show that complete elimination of CSO would only remove a portion of the total wet weather induced pollution in the four planning areas.

The simplified models were used in the assessment and screening because of their ability to simulate long-term conditions, and to model conceptual alternatives. The results of the simplified models were used as input to the Boston Harbor water quality model, which also was based on long-term conditions, and loading-to-impact relationships were developed. These loading-to-impact relationships could be directly compared to the water quality standards, which are also based on longterm (monthly) conditions. The receiving water modeling is further described in Section 4.D.

Dynamic Models. The hydraulic analysis of the combined sewer system and the analysis of peak loads and loading durations is being done with the SWMM model. All planning area consultants are using versions of this model. SWMM simulates all signficant hydraulic conditions, including tidal influence, hydraulic backwater and surcharge, storage, pumping, infiltration, and runoff attenuation. The model is driven by a rainfall event hyetograph, generally of several hours duration.

The SWMM models have been developed for each planning area. The models' primary use is during the detailed evaluation phase, where they are being used to simulate the behavior of the combined sewers and proposed control measures under different storm events. Alternatives developed during the screening phase are being refined in respect to capacity and control needs with SWMM. Results of the SWMM modeling will be used in the selection of design storms for the planning areas. The selection of design storms is described in Section 4.F.

TABLE 5. COMBINED SEWER OVERFLOW AND STORMWATER LOADS UNDER EXISTING CONDITIONS

	AVERAGE ANNUAL LOADS			
COMBINED SEWER OVERFLOW*	VOLUME (million gallons)	TOTAL COLIFORM (organisms)	BOD_5 (pounds)	SUSPENDED SOLIDS (pounds)
Charles River Basin	3,100	53×10^{16}	7×10^{5}	4×10^{6}
Inner Harbor	2,300	300×10^{16}	22×10^{5}	4×10^{6}
Dorchester Bay	340	7×10^{16}	2×10^{5}	4×10^{5}
Neponset River Estuary	60	1×10^{16}	$<1 \times 10^{5}$	1×10^{5}
TOTAL	5,800	36×10^{17}	32×10^{5}	85×10^{5}
STORMWATER*				
Charles River Basin	6,100	2×10^{17}	8×10^{5}	8×10^{6}
Inner Harbor	700	2×10^{17}	8×10^{5}	7×10^{5}
Dorchester Bay	230	2×10^{16}	1×10^{5}	3×10^{5}
Neponset River Estuary **	790	3×10^{16}	7×10^{4}	1×10^{6}
TOTAL	7,820	45×10^{16}	18×10^{5}	10×10^{6}

*Numbers are rounded for consistency in presentation
**Loadings include those to the Neponset Estuary from Milton and Quincy, but not the Neponset River loadings at the Baker Street Dam

Unified Interceptor Model. A model of the interceptor system was developed by the lead consultant to coordinate the individual planning area modeling. The planning area boundaries had been delineated based largely on water quality issues, and some major interceptors crossed the boundaries. The unified interceptor model is a SWMM model, and its results are boundary conditions at planning area boundaries, based on which the area consultants can perform their planning area modeling relatively independently. Figure 2 shows the geographical extent of the unified interceptor model.

Boundary conditions are based on specified storm events and system operating conditions. To date, the existing system under design capacity conditions, and the future system with the relocation of the Boston Main interceptor and the new East Side interceptor, have been modeled for the 1-year 6-hour storm.

The results of the interceptor model show that the Neponset planning area has relatively fixed interceptor capacity at its Dorchester area boundary. Changes in operating conditions in the headworks and Calf Pasture pumping station do not effect the capacity significantly.

The Charles River Basin is upstream of the Inner Harbor area, and inflows from the Charles area were input to the interceptor model. The Charles River Basin consultant determined that if the Ward Street headworks operates at design capacity, then no wet weather flow would be contributed from the Charles Basin to the existing Boston Main interceptor during a 1-year 6-hour storm.

The significance of these results is that the Dorchester Bay-Inner Harbor planning area boundary is the most important area for unified interceptor modeling and for the analysis of interceptor hydraulic impacts between areas. These impacts are continuing to be analyzed through unified interceptor modeling during the detailed evaluation phase, and on into preliminary design.

The unified interceptor model has also shown that the existing interceptor system would be vastly overloaded if it were depended upon for conveyance and containment of the 1-year 6-hour storm. The results show that a low intensity storm, between 0.05 inches per hour and 0.1 inches per hour may be contained by the existing system under design capacity operating conditions.

D. RECEIVING WATER MODELING

This section describes the use and results of the Boston Harbor and Charles River Basin receiving water models. Conclusions were drawn on the results of the receiving water modeling to set planning area objectives, which are described in Section 5.

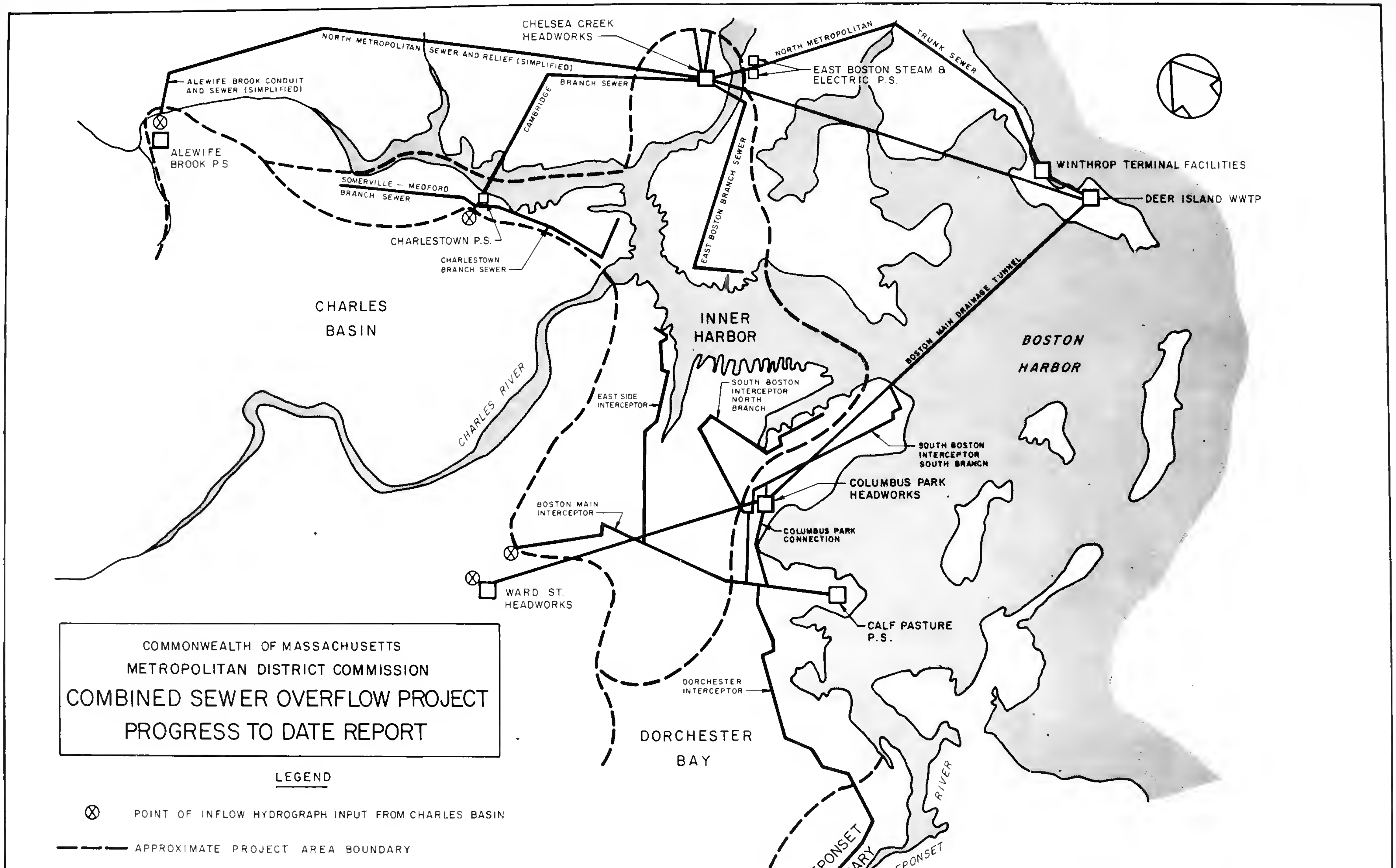

FIG. 2 INTERCEPTOR MODEL SCHEMATIC

Purpose and Scope

Computer-based receiving water models were developed to assess the water quality impact of combined sewer overflows. A model of Boston Harbor was developed by Hydroscience, Inc., and a Charles River Basin model was developed by Metcalf & Eddy, Inc. Figure 3 shows the geographic extent and segmentation of the models.

The harbor model extends up to the Amelia Earhart Dam on the Mystic River, to Mill Creek on the Chelsea River, to the Baker Street Dam on the Neponset River, and to the New Charles River Dam. Sampling in the Mystic and Neponset Rivers above the dams, and in the Upper Chelsea River, provided water quality data for harbor model boundary conditions at these points. The Charles River Basin water quality model provided data for the harbor model boundary at the New Charles River Dam. (The models incorporated the New Charles River Dam as part of the existing situation.)

Description of the Boston Harbor Model. The Boston Harbor Model used thus far in the project is a statistical model which gives results averaged over the tidal cycle. The harbor is conceptualized by over 200 segments which are arranged for a more detailed impact analysis of shellfishing and swimming areas. The model incorporates the effect of the tides, but resultant water quality impacts are computed for long-term average conditions. Time variable harbor modeling is to be performed during the preliminary design phase to show the intra-tidal, time dependent response of the harbor to recommended plan design storm CSO loads.

Loadings input to the harbor model include the following:

a. CSO: developed by the area consultants.

b. Stormwater: developed by the area consultants.

c. River Flow: based on sampling, flow records, and the Charles River Basin Model.

d. Wastewater Treatment Plants: based on operating records.

e. Rim Flows: stream and stormwater loads from areas outside of the four planning areas, based on average, unit drainage area information.

f. Benthic Oxygen Demand: based on benthic samples, an average benthic oxygen demand was used for all parts of the harbor.

The harbor model simulated total coliform, suspended solids, and dissolved oxygen. The model was calibrated for total coliform based on sampling data from the years 1969, 1970, 1972, and 1978 (CSO project data). Suspended solids and dissolved oxygen simulations have not been calibrated because significant CSO-induced impacts were not found, except in the Upper Inner Harbor.

Description of the Charles River Basin Model. This model is a time variable model which includes a 9-segment conceptualization of the Basin, between the Watertown Dam and the New Charles River Dam, and the Back Bay

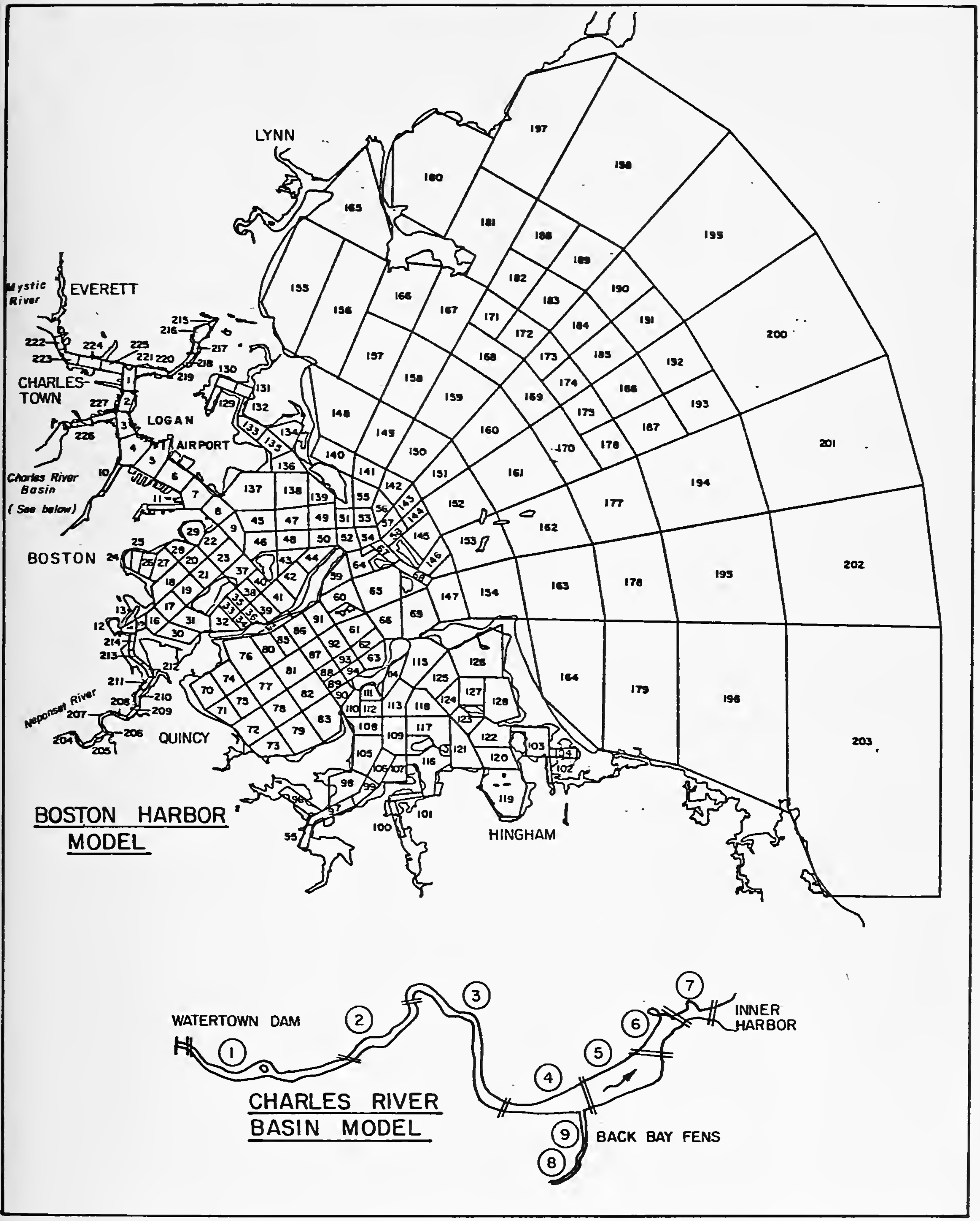

FIG. 3 RECEIVING WATER MODELING AREAS

COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION

COMBINED SEWER OVERFLOW PROJECT
PROGRESS TO DATE REPORT

Fens. Time variable modeling was important in the Basin to simulate time of travel and coliform decay prior to entrance to the harbor. However, the time variable simulation of the harbor was not necessary for screening of alternatives, due to tidal mixing and the ability to develop tidal average concentrations.

The Basin model actually consists of two models: an hydraulic model and a water quality model, and the latter uses information from the former, plus pollutant characteristics. The basic loading and hydraulic inputs to the model are:

a. CSO and stormwater: from land-side models

b. Charles River flow above Watertown Dam: from sampling and flow records

c. The effect of the lower, relatively stagnant salt water layer: from depth and sampling records

d. Dry weather stream flows: from average unit drainage area and infiltration information.

The model provides a time history of Basin hydraulics and concentrations of coliform, BOD, dissolved oxygen, and suspended solids in each segment. The model has been calibrated hydraulically and for these four water quality constituents, based on data from 1974, 1978 and 1979.

Results of the Receiving Water Modeling. The modeling showed coliform to be the most significant form of pollution from CSO. Further, dry weather overflow from CSO outlets contributes most of the coliform reaching the harbor. Coliform standards violations due primarily to dry weather overflow were calculated to occur at the following locations:

Mystic River, below the Amelia Earhart Dam
Chelsea River, below Orient Heights
Charles River, below the New Charles River Dam
Upper Inner Harbor, opposite the Downtown Waterfront
Fort Point Channel
Dorchester Bay Beaches
Neponset River Estuary, near the Quincy/Milton line

It was concluded that dry weather overflow would have to be reduced as the first step in CSO control. Consequently, further analysis of the harbor model results was based on water quality impacts without dry weather overflow loads.

In the Charles River Basin, stormwater was found to be the most significant pollution source above BU Bridge, and CSO the most significant below the bridge.

The treatment plant discharges were found to have a coliform impact of less than one percent in the Inner Harbor, Dorchester Bay and Neponset River Estuary. Of particular significance, the wet weather induced loads from the different planning areas have local impacts, and there are not significant impacts on one planning area from another. The Neponset

River Estuary has only a slight impact on Tenean Beach in the Dorchester Bay area. The coliform impact of stormwater was found generally to be significantly less than that of CSO, which corresponds with the loading information given previously in Table 5 showing stormwater coliform only about one eighth the magnitude of CSO coliform. The following section discusses the interpretation of the State Water Quality Standards and other significant results of the coliform impact assessment.

Interpretation of the State Water Quality Standards. The State Water Quality Standards provide for allowable pollutant concentrations found in samples taken over a monthly period. The Standards allow for mean or median concentrations of all samples taken in a month, and they allow for extreme concentrations in some fraction of the monthly samples taken.

In the CSO Project, the Standards were interpreted on a time frequency basis. Mean and median concentrations allowed in the Standards were assumed to be those concentrations which could occur 50 percent of the time or 182 days per year, without representing a violation.

In Class SB waters, the Standards were interpreted to mean that total coliform could be present in a concentration of 1000 MPN/100 ml for 20 percent of the time, or 73 days per year without representing a violation. And, in Class SC waters, 25,000 MPN/100 ml fecal coliform could be present for 36 days per year, or 10 percent of the time, and the Standards would not be violated. Based on this interpretation of the State Water Quality Standards, harbor coliform concentrations were calculated in terms of their magnitude and frequency of occurrence as described below.

CSO Coliform Impact Results. CSO coliform impacts were found to be relatively short-term, and generally not in violation of the State Standards in the harbor. However, even with dry weather overflow removed, coliform standards violations, or near violations, due to CSO were calculated at the following locations:

- within the Charles River Basin and Back Bay Fens
- Mystic River, below the Amelia Earhart Dam
- Fort Point Channel
- Tenean Beach

Calculated coliform violations in the Neponset River Estuary were due to both CSO and the quality of the river flow over the Baker Street Dam.*

Much of the coliform load in the Tenean Beach area is due to stormwater from the Pine Neck Creek storm drain. The Dorchester Bay area consultant is proposing that the stormdrain be relocated to a point east of Port Norfolk in the Neponset Estuary.

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* Sampling and inspections were performed by the MDC in the spring of 1979 in the Neponset River above the Baker Street Dam. Some continuous wastewater discharges were discovered and eliminated.

The harbor model also provided impact results on the relative frequency of and magnitude of coliform concentrations. This was accomplished as follows. It was determined that the average storm event occurred approximately every 74 hours and lasted about 7 hours, based on the review of the historic period for rainfall analysis, 1948 to 1976. CSO impacts, in turn, occur intermittently, and can be forecast and statistically summarized. Large storms occurring after long dry periods create large CSO loads, small storms create small impacts. The combined sewer system models S/SWMM and SEMSTORM were run with the long-term historic record of rainfall to produce a statistical summary of CSO loadings, based on the actual rainfall events, large and small, which historically occurred. The results of the combined sewer models were input to the harbor model to yield the desired information on the frequency and magnitude of coliform concentrations in the harbor.

Table 6 presents harbor model results at locations that are significant in terms of water quality. These locations -- below the Amelia Earhart Dam, below the New Charles River Dam, at Constitution Beach and four Dorchester Bay Beaches, and in the Neponset Estuary -- are representative of the impact results. Chelsea River impacts were less severe than those in the Mystic below the Amelia Earhart Dam, and Pleasure Bay showed negligible wet weather impacts.

The table shows coliform concentrations which are calculated to occur at the indicated time frequency, represented conceptually as days per year. 182 days per year is 50 percent of the time, or average dry weather conditions; 73 days per year is 20 percent of the time, 36 days per year is 10 percent of the time, and 4 days per year is 1 percent of the time, or seasonal peak conditions.

Standards violations are few, and these are represented by asterisks. The Standards do not define allowable concentrations for conditions which occur with exceedence frequency less than 10 percent, so the calculated frequencies for 4 days per year cannot be compared to the Standards.

In summary, the harbor model results show that highest concentrations of coliform due to CSO occur for short periods of time, and Standards for average conditions are not generally violated. However, the high coliform concentrations following storm events are still of concern where considering the designated uses of swimming, shellfish harvesting, and even recreational boating. This concern was addressed in the establishment of CSO control objectives based on violation-days as discussed later in Section 5.

Dissolved Oxygen and Suspended Solids Impacts. The harbor modeling and the Charles River Basin model each showed that CSO and stormwater are not the major contributors to dissolved oxygen deficits and suspended solids. In the Charles Basin, the influence of the salt water wedge at the bottom of the Basin is the primary dissolved oxygen level control. In the Back Bay Fens, sludge deposits cause sizeable benthic oxygen demand. The harbor model calculated some dissolved oxygen levels near 4 to 5 mg/l, somewhat below the 6.0 mg/l Standard, in the Inner Harbor. Sampling results showed similar concentrations. In the Inner Harbor, it is estimated that about 0.5 mg/l of the calculated oxygen deficits is due to CSO, and about 0.75 mg/l due to the treatment plant primary effluent

TABLE 6. SUMMARY OF HARBOR MODEL RESULTS UNDER EXISTING CONDITIONS

LOCATION AND SEGMENT	CALCULATED COLIFORM CONCENTRATION: Frequency of Occurrence ** (days per year)	CALCULATED COLIFORM CONCENTRATION: Magnitude (number of organisms per 100 ml)
Mystic River, below Amelia Earhart Dam Segment 223	182	1,900
	73	9,100
	36	21,600*
	4	211,000
Charles River, below New Charles River Dam Segment 227	182	1,700
	73	5,500
	36	10,200
	4	49,200
Constitution Beach Segment 130	182	100
	73	800
	36	1,900
	4	16,900
Carson and L Street Beaches Segments 24 & 26	182	75
	73	500
	36	1,400
	4	16,000
Malibu Beach Segment 12	182	100
	73	800
	36	2,000
	4	17,300
Tenean Beach Segment 213	182	400
	73	2,200*
	36	5,600
	4	52,100
Neponset River, near Quincy/Milton line Segment 209	182	700
	73	3,700*
	36	8,800
	4	83,900

*Indicates violation of standard or near violation
**182 days per year represents average conditions.

and sludge discharges. The harbor model showed all beach and shellfish harvesting areas to have dissolved oxygen levels above the Standards.

Most suspended solids in the harbor are due to the base flow of the tributary rivers. Similarly, in the Charles River Basin, the inflow of the Charles River to the Basin at the Watertown Dam contributes most of the suspended solids.

Dissolved oxygen depression and suspended solids concentrations, though not significantly due to CSO, have been addressed in the planning objectives, and these are described later in Section 5.

E. ENVIRONMENTAL ASSESSMENT

This section describes the role of the environmental assessment work in the overall planning.

Purpose and Scope

The Environmental Assessment Report of the facilities plan is being prepared for compatibility with the latest regulations for environmental documents promulgated by the President's Council of Environmental Quality and the EPA under 40 CFR 1500, November 29, 1978, and 40 CFR 6, June 18, 1979. The Environmental Assessment Report follows generally the format for environmental impact reports given in the regulations, and there will be a separate, self contained EA report for each planning area.

The environmental assessment work serves to supplement the other engineering and planning activities, primarily by the analysis of the environmental consequenses of no-action and different CSO control alternatives. The environmental assessment goes beyond the analysis of the basic engineering parameters -- coliform, BOD, and suspended solids -- and includes, for example, economic impacts of lost shellfishing opportunities, recreational impacts, and other environmental issues described below.

Environmental Issues

In November of 1978 a meeting was held to define general environmental issues in the four planning areas. The lead consultant planned the meeting, as part of the environmental assessment guidelines. State and federal agency representatives were invited to respond and add to the list of issues that had been identified by the planning area consultants.

The agencies present at the meeting included the following from the State: Department of Environmental Quality Engineering, Department of Environmental Management, the Executive Office of Environmental Affairs, the Coastal Zone Management Program, the Massachusetts Environmental Policy Act Unit, the Division of Fisheries and Wildlife, the Division of

Water Pollution Control, and the Division of Marine Fisheries. Federal agencies included the Environmental Protection Agency, the Fish and Wildlife Service, and the Corps of Engineers.

Table 7 gives the list of issues identified. These are presented in general, rather than site-specific terms. Based on the general issues, each area consultant considered the site specific issues, and these are described in the following paragraphs.

The major environmental issues discussed were public health, recreation, commercial fishing, and impacts on the area's ecological systems. The public health and recreation issues that were mentioned included water quality at the swimming areas in Dorchester Bay and Constitution Beach. Floating solids and debris and sludge deposits in the Back Bay Fens were cited as among the most visible problems.

Commercial fishing and ecological issues mentioned included restrictions on shellfish harvests and lost finfishing opportunities in the Neponset River Estuary and Dorchester Bay areas. Also of concern were wetlands degradation, recovery of harbor bottom ecology after CSO discharges are controlled, and the ultimate disposal of CSO residual solid wastes. Economic issues of concern were changes in land values and land use. The impact of the project on existing and future land uses, and the possibility of community disruptions during construction were also identified as important issues.

Significant input on environmental issues was also obtained through the public participation program, which is discussed in Section 4.G.

Results of the Environmental Assessment. The environmental issues were analyzed in terms of the environmental consequences of no-action, and the consequences of different CSO control alternatives. Floatables control for aesthetic purposes and coliform control for public health reasons are issues in all planning areas. Other highlights of the environmental assessments are:

- In the Dorchester Bay area, lost shellfishing harvesting opportunities may amount to about $200,000 in lost earnings annually. Depuration, currently required of shellfish taken from the Bay, costs up to $10,000 per year, which is a cost now borne by consumers of local shellfish.

- In the Charles River Basin area, participation in recreational activities is expected to increase during the planning period. Maintaining suitable water quality is essential to provide easily accessible recreational opportunities along the Basin and Back Bay Fens.

- In the Inner Harbor area, the ongoing and proposed development projects along the Downtown Waterfront, Charlestown, and the Fort Point Channel may increase demand for better water quality than now exists.

TABLE 7. PLANNING AREA ENVIRONMENTAL ISSUES

Environmental Issues	Key Factors
Physical Environment	
SURFACE WATER QUALITY	Existing and future characteristics; effect on mixing and stratification; change in salinity; turbidity during construction; effect of other discharges; ability to meet government standards and objectives, implementation schedules, and public preferences; conformance with other plans.
SURFACE WATER QUANTITY	Change in flow rate or characteristics; change in water level or stream channel or bed; change in flood hazard area; displacement of flood water; interbasin transfer considerations; change in runoff.
SEDIMENTATION	Rate of sedimentation; effects of sedimentation on water movement; quality of sediment.
FLOATABLES AND DEBRIS	Aesthetic problems; effect on uses of water resources.
OTHER	Groundwater - change in salt barrier; changes in infiltration and percolation; air - violation of standards; odor problems.
Biological Environment	
FINFISH	Changes in species, populations, and productivity; impacts on sport and commercial fishing; potential for recovery.
SHELLFISH	Changes in populations and productivity; amount of resource protected; degree of public hazard due to tainting; impacts on sport and commercial digging; potential for recovery.

TABLE 7. (continued)

Environmental Issues	Key Factors
Biological Environment (continued)	
WETLANDS	Extent of resource affected; change in habitat quality; value for cleansing of wastewater.
OTHER	Effects on terrestrial areas, migratory bird stopovers, and other similar resources; amount of resource involved.
Human Environment	
SWIMMING	Change in hazard to public; change in size of swimming areas; change in quality of swimming areas.
WATERS EDGE ACTIVITIES	Interference with enjoyment due to odors, floatables, debris, high turbidity; change in public's access to waterfront.
BOATING	Interference with sailing, motor, commercial, and other boating by odors, floatables, debris, high turbidity.
LAND USE	Type and amount of land permanently affected by siting; compatibility of facilities with nearby structures; existence of sufficient buffer area; compatibility with land use plans; impairment of scenic areas.
ECONOMICS	Impact of project monetary costs on the community; interference with business activity such as by obscuring access; number of new jobs; changes in land value; change in tax base; effect on specific development projects.
CSO RESIDUAL SOLID WATES	Character and amount generated; method of transport; additional treatment and final disposal consideration.

TABLE 7. (continued)

Environmental Issues	Key Factors
Human Environment	
PUBLIC INSTITUTIONS	Impairment in the provision or use of public services; any disruption of research, educational, fine arts, health care, or other important facilities.
COMMUNITY DISRUPTION	Effect of the project considering the community's character and goals; interference and detouring of local traffic; transportation levels during construction and during operation; i.e. solids disposal and street cleaning; hazards associated with transportation such as spillage and accidents; problems with noise, vectors, and odors.
RELIABILITY	Potential of human error; effects of poor judgement; problems with political jurisdiction; implementability; ability for facilities to continue operation under adverse conditions; meeting of federal standards; compliance with local goals.
ENERGY	Dependence on energy, amount required; use of alternative energy sources.
CHEMICAL USE	Effect of chemicals in effluent on aquatic systems; effect of deicing activity on stormwater quality.
ARCHAEOLOGICAL AND HISTORICAL RESOURCES	Effect on such existing or potential sites; impairment to enjoyment or use of site.

* In the Neponset River Estuary area, the present appearance of the Estuary is a prime environmental concern. Dry weather overflow (which includes industrial wastes), floatables, and sediments, aside from their water quality impacts, all inhibit water edge activities and depress property values.

In the screening of alternatives, environmental factors were compared in a matrix for each planning area. Water quality, both in public health and aesthetic terms, was the primary factor to be compared against cost. Alternatives selected to be evaluated in detail were those judged most environmentally acceptable, and these are discussed in Section 5.

F. OTHER ENGINEERING ANALYSES

This section describes two additional activities in the CSO Project. These are the analysis of joint area alternatives and the analysis of design storms.

JOINT AREA ALTERNATIVES

Joint area alternatives are those CSO control alternatives that span two or more of the planning areas. The analysis of joint area solutions was needed to determine if economies of scale may exist in large area alternatives, and to look at types of alternatives which would not be feasible for the planning areas individually.

Deep Tunnel and Moon Island Plans. Two joint area alternatives were analyzed during the screening phase. These are: the Deep Tunnel Plan, as proposed in 1967, and size variations thereof; and the use of Moon Island facilities as described in the EMMA Study of 1976. The Inner Harbor area consultant analyzed the Deep Tunnel Plan, and the Dorchester Bay consultant the Moon Island Plan.

The Deep Tunnel and Moon Island plans are alternatives which provide collection, deep tock tunnel storage and/or flow transmission of CSO, and discharge it at a points distant from the critical shore areas. For the CSO Project, only CSO loads were considered in these alternatives, as described below. (The 1967 Deep Tunnel Plan was a multipurpose scheme for both CSO and stormwater. Its cost was updated to 1980 dollars, estimated at $1.5 billion.)

The Deep Tunnel alternative would collect CSO from all four planning areas by collector conduits and transmission tunnels. There would be five radial storage tunnels and a main storage tunnel from Columbus Park to Deer Island, all as in the original 1967 configuration. CSO would be pumped from the tunnel system at a new pumping station at Deer Island. An outfall about nine miles long would discharge to deep ocean waters.

The Moon Island facilities plan was analyzed for three different service schemes. One scheme would collect CSO from the Dorchester Bay and Neponset planning areas. The second scheme would include those two areas plus the northern part of South Boston in the Inner Harbor area. The third scheme would include all of the area along the west bank of Fort

Point Channel. CSO would be collected by transmission tunnels and deep rock tunnels for either storage at a new facility at Calf Pasture and the transmission to Moon Island, or for transmission directly to Moon Island. Stored flows would be pumped back to the interceptor systems in some schemes.

A similar methodology was used in the analysis of both for both the Deep Tunnel and Moon Island plans. A range of control levels was considered for each:

a) Capture of all storms which occur up to 15 percent of the time. This is capture of only small storms and is a relatively low degree of control.

b) Capture of all storms which statistically occur up to 50 percent of the time.

c) Capture of all storms which occur up to 85 percent of the time. This is the highest control level examined.

Design flows and loads to the harbor were estimated for both plans for the three control conditions. Costs and water quality impacts were determined and compared to selected individual planning area alternatives.

The selected alternatives in the individual planning areas, when aggregated, had lower total cost, for similar water quality benefits, than the Deep Tunnel and Moon Island alternatives. Specifically, the joint area alternatives would have about twice the cost. One reason for this is the high cost of building transmission conduits and tunnels to convey CSO over distances of several miles. The individual planning area alternatives provide local treatment and storage, thus saving on transport cost. Largely due to the transport cost, economies of scale were not apparent in these joint area alternatives, and they are not proposed for further consideration in the detailed evaluation.

<u>Maximization of the Existing Deer Island Tunnel System</u>. The lead consultant performed a feasibility study of the possibility of using the existing Deer Island tunnel system for conveying more wet weather flow to treatment at the Deer Island treatment plant. It was determined, with the use of the unified interceptor model, that the existing interceptor system upstream of the three headworks may contribute up to 1500 mgd peak flow to the existing tunnel system during the 1-year 6-hour storm, if there were new facilities built at the headworks sites to pump such flow into the tunnels. However, by providing for either transmission or storage of such flow at the headworks, the carrying capacity of the interceptors at upstream locations would not be significantly increased. New interceptors would have to be built throughout the four planning areas to increase wet weather conveyance capacity where it is most needed. The cost for new wet weather relief interceptors and additional capacity at Deer Island, for either disinfection or primary treatment of wet weather flow, would far exceed the cost of the individual planning area alternatives.

This joint area alternative, like the Deep Tunnel and Moon Island plans, was found very costly due primarily to the expense of transmission facilities. Consequently, it is not proposed for detailed evaluation.

Other joint area alternatives which may be studied will be somewhat smaller in scale than those described above. The Dorchester Bay consultant will look at the feasibility of a joint area solution with the Inner Harbor for utilizing the existing Boston Main interceptor and Calf Pasture pumping station. Also, CSO residual solids disposal alternatives may be considered in joint area solutions, if disposal to the interceptor system does not prove to be feasible or cost-effective.

DESIGN STORMS

The selection of design storm is a way of choosing the degree of CSO control to be provided. In the CSO Project, each planning area may have a different design storm to meet its specific water quality objectives. These design storms are termed water quality design storms. They differ from the hydraulic design storms which will be chosen during the preliminary design phase to provide sufficient hydraulic capacity in proposed facilities.

The 1-year 6-hour design storm has been considered as a reference point for each planning area. It is a good reference point because of its use in the EMMA Study and its use in the current MDC NPDES permit as a target control level. The 1-year 6-hour storm may be the design storm for one or more planning areas, unless the area consultants find another control level to be more cost-effective.

After a number of overflows per year has been selected as a control level, or after other analysis has shown a particular storm to be an appropriate control level, then several real storm events from the historic record will be chosen which give the selected number of overflows per year, or which resemble the selected design storm. These real storms will be run in the SWMM models to determine the behavior of the collection system with proposed CSO control improvements. Storage and treatment capacity requirements will then be refined to meet the control needs of these real storms. The advantage to this approach, rather than use of only one design storm, is that the preliminary design can be analyzed for a range of early and late peaks, longer and shorter durations, and different total volumes per storm.

G. PUBLIC PARTICIPATION

This section summarizes the public participation program, the key public concerns which have been expressed, and responses to these concerns.

Objectives and Scope

The public participation program for the CSO project was developed to fulfill five general objectives:

(1) to develop an informed public constituency;

(2) to provide a sufficient level of public information to allow a meaningful public hearing process;

(3) to utilize, as a data base and project resource, knowledge and experience of various public participants;

(4) to foster a good working relationship between the MDC and its member communities;

(5) to insure that the recommended plan be as responsive as possible to public concerns, and that it demonstrates that public concerns were evaluated and considered.

These objectives were set forth in the public participation guidelines previously described in Section 4.A. The guidelines, prepared last fall for the program, were based closely on the early EPA concept papers for public participation and on the proposed EPA regulations of August 1978. Since publication of the final regulations in February of 1979, certain aspects of the program have been adapted to fit these new regulations.

The public participation program includes the following features:

A mailing list of about 800 citizens, public officials, and organizations, which includes the individual listings for the four planning areas.

A newsletter, published in February 1979 and June 1979, and to be published again in November, which describes for the public the progress, results and direction of the project.

A Citizen Advisory Committee (CAC) composed of 37 members who represent private citizens, public interest groups, economic interests, and public officials of the four planning areas. The CAC has been organized into subcommittees for each planning area, and at-large members whose interests span the whole project area. Mr. Waldo Holcombe of the EPA's Boston Harbor Citizen Advisory Committee and the Neponset Conservation Association was recently elected chariman of the CAC. Table 8 lists the members of the committee.

Public meetings and public hearings, as required by facilities planning regulations, are held in each planning area to provide for local resident involvement.

Table 9 presents a list of the public meetings, Citizen Advisory Committee meetings and CAC subcommittee meetings which have been held, and those that are scheduled for October. Public hearings will be held in early 1980, after completion of the draft facilities plan. After the public hearings the draft facilities plans will be updated to incorporate public comments, and the updated plans will then be submitted to EPA and the Division of Water Pollution Control.

TABLE 8. CITIZEN ADVISORY COMMITTEE MEMBERS

Members of the Citizen Advisory Committee and the organizations they represent are listed below:

Arthur Barnes, Massachusetts Audubon Society
Eugenie Beal, Office of the Mayor, City of Boston
Thomas Burke, South Boston Residents Group
Thomas Butler, South Boston Citizens Association
Charles Button, Boston Water and Sewer Commission
Augustine Calabrese, Massachusetts Bay Yacht Clubs
Robert Calder, Boston Shipping Association
Thomas Cheney, Popes Hill Civic Association
Marianne Connolly, Neponset Conservation Association
Thomas Conroy, Metropolitan Area Planning Council
Anna DeFronzo, East Boston Land Use Council
Lorraine Downey, Boston Conservation Commission
Joseph Durano, Somerville Conservation Commission
Jack Garland, Cedar Grove Civic Association
*Waldo Holcombe, EPA Boston Harbor Citizens Advisory Committee
Paul Madden, Massachusetts Building Trades Council
Terry Mair, Columbia Point Tenants Task Force
Mary Maloney, Neponset Civic Association
Guy McLeod, New England Aquarium
Herbert Meyer, Mystic River Watershed Association
Office of the Mayor, City of Chelsea
Amy Oppenheimer, Sierra Club
Hugh O'Rourke, Boston Fisheries Association
Gaston C. L. Patin, Public Works Department, City of Cambridge
Willard Prince, University of Massachusetts, Columbia Point
Edward Petcavage, Charles River Watershed Association
Emily Pugliano, North End Task Force
Robert Ruddock, Greater Boston Chamber of Commerce
Mrs. Sidney Shurcliffe, League of Women Voters of Boston
Norman Smith, Boston Waterfront Association
George Sundstrom, Dorchester United Neighborhoods Association
C. F. Taylor, Longwood Neighborhood Association
Rita Walsh-Tomasini, Columbia-Savin Hill Civic Association
Michael Ward, Boston Sailing Center
Thomas Weikle, Fenway Project Area Committee
Joseph Wolfson, Community Boating, Inc.
Nancy Wrenn, The Boston Harbor Associates

*Chairman

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TABLE 9. PUBLIC PARTICIPATION PROGRAM MEETINGS
SEPTEMBER 1978 to OCTOBER 1979

MEETING TYPE	PURPOSE	DATE AND LOCATION
General Public Informational Meeting	To announce the start of the project, and describe its scope of purpose	September 19, 1978 New England Aquarium, Boston
Planning Area Public Meetings	To identify issues of concern in the planning areas	
• Dorchester Bay		November 13, 1978 I.B.E.W. Hall, Dorchester
• Inner Harbor		December 4, 1978 New England Aquarium, Boston
• Charles River Basin		December 7, 1978 Museum of Science, Boston
• Neponset River Estuary		November 21, 1978 Old Dorchester Post, Dorchester
Citizen Advisory Committee	To organize the CAC	January 23, 1979 Leverett Saltonstall Building, Boston
Citizen Advisory Committee Subcommittee Meetings	To present the results of the assessment of existing and future no-action conditions	
• Dorchester Bay		March 21, 1879 UMASS Field Office, Dorchester
• Charles River Basin		March 29, 1979 Metcalf & Eddy Office, Boston

TABLE 9. (continued)

MEETING TYPE	PURPOSE	DATE AND LOCATION
• Inner Harbor		April 10, 1979 MDC Building, Boston
• Neponset River Estuary		July 31, 1979 Old Dorchester Post, Dorchester
Citizen Advisory Committee	To present the results of the screening of alternatives	July 17, 1979 Boston City Hall, Boston
Planning Area Public Meetings	To discuss the alternatives selected for detailed evaluation	
• Inner Harbor		September 27, 1979 MDC Building, Boston
• Neponset River Estuary		October 2, 1979 Old Dorchester Post, Dorchester
• Dorchester Bay		October 3, 1979 Cleveland Community School, Dorchester
• Charles River Basin		October 9, 1979 MDC Building, Boston
Citizen Advisory Committee	To discuss CSO control plan selection	October 23, 1979

Public Concerns and Response

A number of concerns have been raised by public participants to date. These are presented below along with responses made to the public. This review of the public concerns and responses has been prepared as an interim responsiveness summary for public participation to date in the CSO Project.

Public Comments and Concerns	Responses
Why another study? Why not start construction on previous CSO plans?	These questions were responded to at public meetings in November and December 1978. The newletter of February 1979 included an article which described the relationship of this study to previous ones. Emphasis was made that this plan is the first step in the three step EPA and DWPC construction grants program.
The sewers in the Port Norfolk area are periodically blocked and basement flooding occurs.	Members of the Boston Water and Sewer Commission attended meetings in November and December of 1973 when the concerns were raised. In Port Norfolk and other areas where sewer operating problems were discovered, the BWSC sent out maintenance crews to remedy the situations. Certain points of dry weather overflows found were also corrected by the BSWC. However, some problems, like these in the Port Norfolk area, cannot be completely eliminated without the major improvements that will be recommended in the facilities plans.
Is the possibility being fully explored of diverting Stony Brook flow, from upstream of Jamaica Plain where it starts to receive combined sewer overflow, to the Back Bay Fens to augment the flow there?	This proposal was studied by the Charles River Basin Consultant. The advantages and disadvantages were explained to Mr. Charles Taylor and Dr. Herbert Meyer at a special meeting on this subject. The scheme does not appear to be a cost-effective pollution control measure.
What are the capabilities of the harbor model?	Several question have been raised at public meetings regarding the function and capabilities of the harbor model. In addition to the answers provided at these meetings, a special presentation on the model by Hydroscience was made at the September 27, 1979 public meeting held at the MDC.

Public Comments and Concerns	Responses
Will the CSO Project make the Charles Basin and Boston Harbor better for boating? Floatables especially should be reduced.	Floatables control is proposed for the significant CSO outlets, and the possibility of floatables control at all CSO discharges is being studied. The present quality of the harbor and the Charles Basin is safe for boating, and the availability of sampling data at the MDC office was made known.
What steps are being proposed for dry weather overflow control in the Downtown Waterfront Area?	Dry weather overflow sources were identified by the Inner Harbor area consultant and the BSWC. The discharge near the New England Aquarium will be eliminated with construction of the new East Side interceptor proposed by the BWSC. The CSO Project facilities plan will have recommendations for dry weather overflow control at other locations.
Will the CSO Project recommendations deal with sedimentation at Tenean Beach and the Neponset River Estuary?	This question was responded to at early public meetings and in the newletter of February 1979. The CSO Project has identified CSO contributions to solids in these areas, and the CSO contribution has been found to be only a small fraction. Most of the sedimentation is due to the load of solids carried by the Neponset River. Therefore, the CSO Project cannot, by itself, correct the sedimentation situation.

5. SCREENING AND SELECTION OF ALTERNATIVES

The results of the activities previously described were brought together in the screening and selection of alternatives for detailed evaluation. This section describes the basic screening methodology and the planning objectives and selected alternatives which resulted from it. The discussion is presented in three parts:

- screening methodology
- preliminary objectives
- alternatives selected for detailed evaluation

Screening Methodology

The screening of planning area alternatives included a conceptual analysis of CSO control levels and an investigation of different technologies to achieve these control levels.

The conceptual analysis covered a range of control levels, from no-action to containment of the 1-year 6-hour storm and greater events. The combined sewer models and receiving water models were applied to determine loads and impacts for the range of conditions.

Table 10 presents a comparison of CSO loadings between existing conditions and storage of the 1-year 6-hour storm, termed the maximum storage alternative. The data exemplify the representative ranges of control in each planning area. Note, however, that even greater control is being considered in some planning areas. For example, for overflow near beaches and shellfish areas, as few as zero overflows per year are being considered.

With a range of possible control levels identified, the consultants considered the different technologies that could be applied to accomplish such control. The lead consultant prepared a list of CSO control techniques considered practical for the CSO Project, which served as a start in the technology screening. The list is given in Table 11. The area consultants expanded on the list where other techniques were investigated for their particular planning areas.

CSO control techniques marked with asterisks were considered during the joint area alternatives analyses described previously in Section 4.F. The other techniques were considered for individual planning area applications.

The area consultants considered the following factors in screening the technologies and their application in the planning areas:

- cost
- required treatment efficiency and effluent quality
- environmental impacts
- site requirements and availability
- reliability

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TABLE 10. COMPARISON OF EXISTING CONDITION AND MAXIMUM STORAGE ALTERNATIVE CSO LOADS

Loading Parameter	Existing Condition Loads	Maximum Storage Alternative Loads
Total Coliform (number x 10^{16} per year)		
Charles River Basin	53	2.0
Inner Harbor	320	38.0
Dorchester Bay	7	0.9
Neponset River Estuary	1	0.04
TOTAL	381	40.9
BOD (10^5 pounds per year)		
Charles River Basin	7	0.80
Inner Harbor	22	3.04
Dorchester Bay	2	0.20
Neponset River Estuary	1	0.03
TOTAL	32	4.07
Suspended Solids (10^5 pounds per year)		
Charles River Basin	40	2.0
Inner Harbor	36	3.55
Dorchester Bay	4	0.48
Neponset River Estuary	1	0.05
TOTAL	81	6.08
Overflows Per Year (number)		
Charles River Basin	120	3
Inner Harbor (not available)		
Dorchester Bay	55	8
Neponset River Estuary	147	12
TOTAL	322	23
Volume (million gallons per year)		
Charles River Basin	3,100	190
Inner Harbor	3,266	269
Dorchester Bay	335	50
Neponset River Estuary	62	7
TOTAL	6,763	516

TABLE 11 CSO CONTROL TECHNIQUES

SEPARATION

- Full
- Disconnect selected drains and roof leaders

OPERATIONAL CONTROL

- Automated tide gates
- Regulator improvements
  - Static regulators (weirs, orifices)
  - Dynamic regulators (gates, float operators)
- Real time remote control systems
- Catch basin design to retain additional solids
- Catch basin cleaning
- Street cleaning and sweeping
- Sewer cleaning and flushing
- Improved sewer maintenance
- Litter control and solid waste management
- Materials storage and pesticide and fertilizer control on parkland
- Control of snow removal and deicing practices
- Repairs and modifications to existing conveyance facilities and appurtenances

STORAGE

- Overland flow modification (runoff diversions)
- Porous pavements
- Retention basins (upstream of the sewer system)
- On-line storage
- Off-line storage (temporary diversion from the sewer system)
- *Storage at headworks
- *Deep tunnels

*DUAL USE OF TREATMENT FACILITIES (Deer Island)

- Treatment through the full process stream
- Treatment through a partial process stream

*See note on next page

TABLE 11 (cont'd.)

LOCAL CSO TREATMENT

- Physical/Chemical
  - Sedimentation (with and without chemicals)
  - Swirl concentrators
  - Helical bend concentrators
  - Screening (microscreen, drum, rotary, disc, static)
  - Dissolved air flotation
  - High rate filtration
- Disinfection
  - Chlorine
  - Hypochlorite
  - Ozone
  - Other

CSO RESIDUAL SOLIDS TREATMENT AND DISPOSAL

- Joint treatment with wastewater treatment plant solids
  - Disposal to the interceptor system
  - *CSO solids trucked to wastewater treatment plant
- Separate treatment and disposal

*These techniques were considered or will be during the analysis of certain joint area alternatives discussed in Section 4.F.

The area consultants, after making preliminary determinations on the most feasible technologies, were able to assign costs and environmental impacts to different CSO control alternatives at different levels of control. This information could be weighed against receiving water modeling results to establish preliminary planning objectives.

Preliminary Planning Objectives

The Summary of this report lists the general objectives for the CSO Project. In this section, the objectives of each planning area are discussed.

Dorchester Bay. The harbor model results showed that dry weather overflow elimination (or extensive reduction) is a necessary initial objective. The designated uses of Dorchester Bay waters -- those uses of swimming and boating, in particular -- make control of floatables a second objective. Third, the cost and technologies analysis showed that 0 to 16 overflows per year would be a feasible objective for coliform control. The actual cost-effective point will be determined during the detailed evaluation.

Harbor model results did not show dissolved oxygen and suspended solids to be a problem in the Bay, and no control for those parameters will be considered beyond that which is provided to attain 0 to 16 overflows per year.

Charles River Basin. The harbor model showed that the Charles River Basin has measurable impact in the harbor only immediately below the New Charles River Dam. However, this impact does not contravene the coliform or dissolved oxygen Standards. Therefore, objectives for CSO control were based on conditions in the Basin.

Coliform Standards are now being violated at times during the year. Coliform control to the levels given in the Water Quality Standards for the 1-year 6-hour storm is one objective. As in Dorchester Bay, dry weather overflow control and floatables removal are additional objectives. Unlike Dorchester Bay, benthic oxygen demand is a problem in the Basin and the Back Bay Fens. Therefore, a CSO control objective is to limit solids which may create benthic oxygen demands. Dissolved oxygen will be improved with the continued operation of the aerators and with completion of the New Charles River Dam. Reduction of BOD in CSO discharges will be accomplished as part of the control provided for coliform.

Neponset River Estuary. System operational problems are overriding issues in the Neponset Area. The consultant found that alternatives for improving the collection system would to a large extent ameliorate CSO

conditions. At this time, the end of the screening phase, containment of the 1-year 6-hour storm by storage is the objective, after correction of the collection system problems. Dry weather overflow control will be accomplished by collection system improvements. It is unlikely that the SB Standards in the estuary can be met through CSO control alone, given the contribution of pollution from the Neponset River and from stormwater. The Neponset River area consultant notes that due to these contributions, the water quality returns of CSO control diminish rapidly for control beyond elimination of dry weather overflow.

Inner Harbor. Dry weather overflow is most pronounced in the Inner Harbor area, and its control is a prime objective. Dry weather overflow control will be accomplished through the continuation of the Charlestown sewer separation project and the Boston Main interceptor and East Side interceptor projects of the BWSC. Beyond dry weather overflow control, coliform control to the levels stipluated for Class SC waters is the next objective. Coliform Water Quality Standards violations were forecast only in the Fort Point Channel and below the Amelia Earhart Dam. No coliform Standards violation was forecast for Constitution Beach, but similar to the Dorchester Bay beaches, overflow control near it will be examined for 0 to 16 overflows per year.

Settleable solids and dissolved oxygen deficits are of concern in parts of the Inner Harbor, and their control will be evaluated for the Fort Point Channel area, below the Amelia Earhart Dam, and in the waters near East Boston and Chelsea. Dissolved oxygen is below the 6.0 mg/l Standard, as described previously, but CSO control alone may not meet the dissolved oxygen Standard.

Floatables control will be investigated for all overflows, but at the present time, floatables control in the Downtown Waterfront area and Fort Point Channel appears most necessary.

The Selected Alternatives

Table 12 presents the different types of technologies which have been selected for detailed evaluation. This table is intended as a quick overview of the array of technologies and the subareas for which they are being considered. For each planning area, the selected alternatives are further described below. Some of the alternatives include uncontrolled discharges, and these are discussed following the description of selected alternatives.

The results of the Clinton Bogert Associates flushing study were reviewed by the area consultants. Sewer flushing was selected for detailed evaluation in part of the Charles Basin and Neponset River planning areas.

TABLE 12. CSO CONTROL TECHNOLOGIES SELECTED FOR DETAILED EVALUATION

SERVICE AREAS	CHARLES RIVER BASIN						INNER HARBOR				DORCHESTER BAY		NEPONSET RIVER ESTUARY	
CSO CONTROL TECHNOLOGIES	Cottage Farm	Charles River Estuary	Stony Brook/Back Bay Fens	Muddy River	Allston/Brighton	Alewife Brook	Boston/South End	East Boston/Chelsea	Charlestown/Somerville	South Boston	Dorchester	South Boston	Port Norfolk	Granite Avenue
Full Separation													●	
Partial Separation		●			●	●			●					●
Separation Plates	●	●												
Insystem Modifications	●	●	●	●	●	●		●			●	●		
Regulator Improvements							●	●	●	●	●	●	●	●
Automated Tidegates											●	●	●	
Tidegate Improvements	●	●	●	●	●	●		●	●	●	●	●	●	●
Street Sweeping	●	●	●	●	●	●							●	●
Catchbasin Cleaning							●	●	●	●	●	●	●	●
Sewer Flushing													●	●
Sewer Cleaning											●	●	●	●
Flow Diversion			●	●										
Flow Pumping													●	●
Detention						●								
Surface Storage			●		●									
Off-line Storage			●		●	●			●		●	●		●
In-line Storage			●	●		●	●		●	●	●	●		●
Conventional Disinfection			●	●	●	●					●	●	●	●
Highrate Disinfection			●		●	●	●	●	●	●				
Screening			●	●	●	●	●	●	●	●	●	●	●	●
Grit Removal							●	●	●	●			●	●
Swirl Concentrators						●	●		●	●				

Dorchester Bay. Three CSO abatement alternatives were selected to proceed into the detailed evaluation phase. The alternatives were selected based on their known or potential ability to meet the following criteria:

1. Conforms with the planning area's CSO abatement objectives
2. Cost effectiveness
3. Minimum operational problems associated with the constructed facilities,
4. Minimum environmental consequences.

Two structural alternatives were selected: the unit processes of storage and disinfection with both to include screening. A description of each is given below.

For the South Boston area, the effectiveness of a storage/containment facility located in the vicinity of Columbus Park are being evaluated and the cost associated with reducing the number of violation days per year to the 0 to 16 range will be analyzed.

For the Dorchester area, the effectiveness of two storage/containment facilities, will be evaluated along with the same cost to overflow day analysis described above.

Storage alternatives are also being evaluated under the best management practices (BMP) of existing in-line storage and real-time system operation. The results of this evaluation are being coordinated with the sizing of storage/containment facilities.

Additional investigations during the detailed evaluation phase are required to estimate the effectiveness of disinfection and any resultant impacts on the bay's aquatic life, prior to determining the appropriateness of using the disinfection process.

Six best management practices were selected as being applicable to the Dorchester Bay study area and are being evaluated in detail:

- Regulator Maintenance
- Catchbasin Cleaning and Maintenance
- Sewer Cleaning
- Tidegate Repair and Maintenance
- Existing In-line Storage and Real-Time System Operation
- Legislation

Sewer flushing was determined not to be cost-effective for the Dorchester Bay planning area.

Charles River Basin. The selected alternatives are presented below by subarea in the Basin:

Cottage Farm Subarea
- Insystem modifications
- Improvements at the Cottage Farm Station
- Separation plates replacement in common manholes

Charles River Estuary Subarea

- Insystem modifications at flow dividers and tidegates
- Optimization of the Charles River Estuary Facility
- Partial separation in Somerville
- Coordination of Estuary Facility operation with Stony Brook system insystem storage

Stony Brook/Back Bay Fens Subarea

- Insystem modifications
- Off-line storage
- In-line storage
- Surface storage
- Diversion of flow in Old Stony Brook Conduit to the Charles River Estuary Facility
- Diversion of flow to the Inner Harbor area
- Screening and disinfection

Muddy River Subarea

- Insystem modifications for Brook Street and Kent Square overflows
- In-line storage) for the St. Mary's
- Screening and disinfection) Street overflow
- Flow diversion to Cottage Farm)

Allston/Brighton Subarea

- Insystem modifications
- Surface storage
- Screening and disinfection: Faneuil Valley Brook Culvert and Shepard Brook Drain
- Off-line storage: North Beacon Street, Western Avenue, Parson Street
- Sewer separation: Faneuil Valley Brook, Sheppard Brook, Smelt Brook

Alewife Brook Subarea

- Concord Avenue: Screening and disinfection
  Separation
- Rindge Avenue: Screening and disinfection
  Separation
  Swirl Concentrator
- Concord and Rindge Avenue Combined: Off-line storage
- Massachusetts Avenue: Screening and disinfection
  Separation
- Tannery Brook: Screening and disinfection
- Massachusetts Avenue and Tannery Brook Combined:
  Screening and disinfection
  Disinfection and detention

In addition to these structural alternatives, street sweeping is being evaluated for use in the Charles River Basin planning area.

Neponset Estuary. Abatement concepts which remain for formulating actual dry weather overflow and CSO control strategies are the following:

Granite Avenue
- Partial separation
- Regulator improvements
- Intercepted flow or overflow pumping
- In-line storage
- Off-line storage
- Screening and disinfection
- Grit removal

Port Norfolk
- Separation
- Regulator improvements
- Automated tide gates
- Intercepted flow or overflow pumping
- Screening and disinfection
- Grit removal

In addition to these construction alternatives, an overlay of catch basin and sewer cleaning practices, street sweeping, and sewer flushing are being evaluated for each service area.

Inner Harbor. Three alternatives were selected for detailed evaluation. Associated with these three alternatives are the two background conditions of replacing the East Side Interceptor as well as the Boston Main Interceptor and continuing with the complete separation of sewers in the Charlestown area as planned by the BRA. The first alternative involves capturing and treating and overflows in Fort Point Channel and overflows in South Boston; this does not include the overflows in the waterfront area (overflows 057, 058, 060, and 061). The second alternative involves improving the existing Somerville overflow facility and constructing a new facility on the outfall conduit (overflow 007A). The third alternative involves picking up the overflows in the waterfront area and conveying them to the Fort Point Channel Facility for treatment, plus facilities in East Boston and Chelsea.

Each facility is being evaluated for the following process techniques:

- in-line storage vs different pumping rates
- high rate disinfection by sodium hypochlorite or chlorine dioxide
- grit removal
- floatables, grease and oil control

The Inner Harbor area consultants proposal for a new facility in the Fort Point Channel area is being discussed with the EPA and DWPC regarding its compatibility with the Union Park Street pumping station and planned chlorination and detention facility by the BWSC and BRA.

The BMPs being evaluated include catch basin cleaning and regulator improvements.

Alternatives 1 and 3 are also being evaluated for accepting wet weather flow from approximately 300 acres in the Charles River Basin planning area in the vicinity soutwest of Dudley Square in Roxbury. This evaluation is being coordinated with the Charles Basin consultant.

Uncontrolled Discharges

The screening of alternatives phase has shown that certain overflows have very little water quality impact, as measured by coliform, dissolved oxygen and suspended solids. These minimal impact CSO's fall into one of three categories:

1) Small overflows in low impact areas: For example, BOS-080 in the Reserved Channel

2) Overflows which receiving water modeling has shown do not cause contravention of the Water Quality Standards: for example, all overflows in East Boston and Chelsea.

3) Overflows which combined sewer modeling has shown will not overflow significantly during the design storm (at present the 1-year 6-hour storm): for example, CAM-011 at Plympton Street in Cambridge.

The area consultants are proposing that no control for coliform, BOD, or suspended solids be added to these CSO's. However, the consultants will make further analysis of floatables, grease and oil control for all discharges. Costs will be developed for the incremental cost of control of floatables grease and oil at outlets which will be controlled for coliform. Costs will also be developed for floatables, grease and oil control at all outlets not otherwise controlled.

During the detailed evaluation phase, the area consultants will identify by NPDES number those CSO's which they propose to leave uncontrolled. At that time CSO loadings to the harbor for the selected design storms will be determined. Based on these results further discussions with the MDC and regulatory agencies will be held regarding minimum controls and uncontrolled discharges in the planning areas.

6. THE WORK AHEAD

The original project schedule called for selection of recommended plans for CSO control at the beginning of August, 1979. The field work and screening of alternatives required more time than originally allotted, and at present the selection process is scheduled to take place in October and early November, 1979.

The area consultants are presently completing the detailed evaluation of alternatives. The work includes:

- cost-effectiveness analyses
- water quality impact and CSO loading analyses
- environmental assessment
- consideration of legal and institutional issues.

The area consultants will rank their selected alternatives in terms of cost-effectiveness and environmental acceptability in mid-October.

Public input on the selected alternatives and possible recommendations is being obtained through public meetings in late September and early October, and through a Citizen Advisory Committee meeting in late October. Regulatory agency comment on proposed recommendations will be sought in early November.

After selection of CSO control plans, then the implementation and preliminary design will be addressed. Implementation issues are:

- Ownership of new facilities and existing facilities
  It is possible that MDC may acquire some existing community facilities (sewers and CSO control structures), and that the communities may be asked to institute new maintenance programs, such as catch basin cleaning.

- Construction Staging
  The CSO Project staging will be coordinated with other ongoing EMMA projects. Within the CSO Project, the four planning areas' work will be scheduled to address priority problems first.

- Financing
  Funding sources will be identified, and user charges developed for proposed improvements. The financial impact on MDC member communities will be examined.

The lead consultant will develop guidelines for the implementation programs, and will coordinate the financing and staging plans to be developed by the area consultants.

The preliminary design work will include the finalization of design storms, sites, and conduit routes. Design criteria will be refined and CSO control processes sized. Field work to determine subsurface soil conditions at key locations will be performed.

The recommended plan will be analyzed for receiving water impacts in the Charles River Basin and Boston Harbor.

* * * * *

At this writing, the completed draft facilities plans are scheduled for completion in early 1980. Public hearings will be held in the spring, and the draft plans, together with public comments will be submitted for DWPC and EPA review in mid-1980. It is anticipated that the regulatory agency reviews can be completed in six months, and final facilities plans be prepared in the spring of 1981. The lead consultant will prepare a summary report on the CSO Project upon finalization of the four facilities plans. This would complete Step 1.

APPENDIX A

AREA CONSULTANTS DRAFT CHAPTERS

This appendix is being submitted to the EPA, the Massachusetts Division of Water Pollution Control and the Department of Environmental Quality Engineering, under separate cover.

APPENDIX B

LIST OF CSO OUTLETS AND REGULATORS

A listing of CSO outlets and regulators is included here for each of the four planning areas. The CSO outlets and regulators are owned by either the MDC, the cities of Boston, Cambridge, Chelsea, and Somerville, and the town of Brookline. Ownership is indicated in the tables as follows:

MDC ..... Metropolitan District Commission
BOS ..... City of Boston
BRO ..... Town of Brookline
CAM ..... City of Cambridge
CHE ..... City of Chelsea
SOM ..... City of Somerville

PART ONE

DISCHARGES IN THE INNER HARBOR PROJECT AREA

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations * and Remarks
BOS001	96"	Orient Heights Beach		SW	Boston Harbor	
BOS002	60"(C)	Moore St. Extended	Sump-type regulator and tide gate chamber followed by a 5 foot diameter circular conduit	SAN/SW	Boston Harbor	
BOS003	2-120"x144" (R)	South west side of Sirport	Three sump type regulators with tide gates followed by a 144"x120" horseshoe shaped concrete conduit and double 120x144 rect. reinforced conc. conduits.	SAN/SW	Boston Harbor	
BOS004	49"(C)	Maverick Street approx. 800 ft. east of Jeffries St.	Sump-type regulator with a tide gate chamber followed by 51" diameter circ. conc. conduit.	SAN/SW DWO	Boston Harbor	Siphon under MBTA tunnel is plugged causing surcharge and dry weather overflow
BOS005	24"x27"(OV)	Sumner St. extended	Sump-type regulator followed by a 24"x27" ovoid shaped brick conduit	SAN/SW	Boston Harbor	
BOS006	24"x26"(R)	Off Marginal St. at Ruth St.	Sump-type regulator and tide gate chamber followed by 24"x26" rect. wooden conduit	SAN/SW	Boston Harbor	
BOS007	30x36"(R)	Cottage St. Extended near Marginal St.	Sump-type regulator and tide gate chamber followed by 36"x36" rect. wooden conduit	SAN/SW	Boston Harbor	
BOS008	24"	Lewis St. extended	24" circ. vitrified clay storm drain	SW	Boston Harbor	
BOS009	36"x36"(R)	New Street Extended	Sump-type regulator and tide gate chamber followed by a 36"x36" rect. wooden conduit	SAN/SW	Boston Harbor	

EAST BOSTON

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations * and Remarks
BOS010	60"(C)	Off Border Street., 200 ft. north of Decatur Street.	Sump-type regulator and tide gate chamber followed by a 60 inch circ. concrete conduit	SAN/SW	Boston Harbor	
BOS011	36"x36"(R)	Lexington St. Extended at Border St.	Sump-type regulator and tide date followed by a 36in. circ. concrete conduit and a 36"x36" rect. wooded conduit	SAN/SW DWO	Boston Harbor	Regulator sump was plugged causing DWO. Invert elevation of the overflow pipe is too low.
BOS012	20"x24"(R)	Eutaw St. Extended at Border Street	Sump-type regulator and tide gate chamber followed by a 36"x36" brick arch and a 20"x 24" rect. wooded conduit	SAN/SW	Boston Harbor	
BOS013	20"x24"(OV)	Meridian St. at the Chelsea River	Sump-type regulator and tide gate chamber followed by a 20"x24" oval shaped brick conduit	SAN/SW DWO	Chelsea River	Regulator sump was plugged causing DWO. Invert elevation of the overlow pipe it too low.
BOS014	48"x60"(E)	Chelsea River near Eagle Square	Sump-type regulator and tide gate chamber followed by a 48"x60" egg shaped brick conduit	SAN/SW	Chelsea River	
BOS015	48"x52"(MC)	Chelsea St. near Bridge	2 sump-type regulators and tide gate chambers followed by a 48" circ. concrete conduit	SAN/SW	Chelsea River	
BOS016	12"	Clyde St. Extended	12" circ. vitrified clay storm drain	SW	Chelsea River	

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations* and Remarks
BOS017	63"(C)	Beach St. Extended	Sump type regulator and tide gate chamber followed by a 63" circ. brick and conc. conduit. Along side a separate 72" circ conc. conduit for storm drain	SAN/SW DWO	Mystic River	A separate storm drain and CSO are side by side at this site. A blockage of CSO regulator causes DWO.
BOS017A	15"	Terminal St. near Medford St.	Storm drain	SW	Little Mystic Channel	
BOS017B	48"(C)	Terminal St. near Medford St.	Storm Drain	SW	Little Mystic Channel	
BOS018	42"(C)	Off Medford St. near Starrking Ct.	24" circ. vitrified clay storm drain	SW	Little Mystic Channel	Recently replaced a CSO at this site. The drainage basin now has a separate system.
BOS019	30"x40"(H)	Chelsea St. extended near Chelsea St.	Sump-type regulator and tide gate chamber followed by a 30" x39" egg shaped brick conduit and a 30"x40" horseshoe shaped brick conduit.	SAN/SW	Little Mystic Channel	
BOS020	64"x92"(O)	Vine St. extended near Chelsea St.	2 sump-type regulators and a tide gate chamber followed by a 46"x64" oval brick; a 64" x92" oval brick and a 60" circ. conc. conduit	SAN/SW	Boston Harbor	
BOS021	36"x36"(R)	Water St. at Wapping St. Extended	Sump-type regulator and tide gate chamber followed by a 36" x36" Rect. reinf. conc. conduit	SAN/SW	Boston Harbor	
BOS022	48"(C)	Water St. at Grey St. Extended	Sump-type regulator and tide gate chamber followed by a 48" circ. conc. conduit	SAN/SW	Boston Harbor	
BOS023	30"x36"(E)	Charles River Ave. Extended	Sump-type regulator and tide gate chambe followed by a 30" x36" egg shaped brick conduit	SAN/SW	Boston Harbor	
BOS024	20"x26"(E)	Warren Ave near Front St.	Sump-type regulator and tide gate chamber followed by a 30" by 36" egg shaped brick conduit	SAN/SW	Boston Harbor	

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations* and Remarks
BOS025	30"x36"	Front Street near Rutherford Avenue	Sump-type regulator and tide gate chamber followed by a 30" x36" egg shaped brick conduit	SAN/SW	Boston Harbor	
BOS026	24"x24"(R)	Across Railroad Yard near Front Street	Sump-type regulator and tide gate chamber followed by a 24"x24" rect. wood conduit	SAN/SW	Millers' River	
BOS027	72"x72"(R)	Austin Street near Front Street	Sump-type regulator and tide gate chamber followed by a 72" 84" U-shaped conc. to a 72"x 72" rect. wooden conduit	SAN/SW DWO	Millers' River	Blockage of regulator causing a constant dry weather overflow
BOS028	3-48"	Across Railroad Yard Crescent St. Extended	Sump-type regulator and tide gate chamber followed by a 36"circ. reinf. conc. conduit	SAN/SW	Millers' River	
BOS029	15"	Mystic River east of Malden Bridge	15" circ. reinf. conc. storm drain	SW	Mystic River	
BOS030	20"	Mystic River west of Malden Bridge	20" circ. brick storm drain	SW	Mystic River	

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations* and Remarks
BOS050	36"C	Near Beverly St. and Warren St. Bridge	High outlet-type flow divider with tide gate chamber followed by 36" reinf. conc. circ. conduit	SAN/SW	Charles River	
BOS051	36"x36"(R)	Prince St. Extended	High outlet-type flow divider with tide gate chamber followed by 36"x36" Rect. wood conduit, plugged	Abandoned	Charles River	The outlet end of conduit couldn't be located.
BOS052		Charter St. Extended	High outlet-type flow divider with tide gate chamber followed by a 16"x24" wooden rect. conduit	SAN/SW	Boston Harbor	
BOS053		Hanover St. Extended	High outlet type flow divider with tide gate chamber followed by 36" circ. cast iron conduit and is plugged	Abandoned	Boston Harbor	
BOS054		Battery St. Extended	Sump-type regulator and tide gate chamber followed by a 24"x24" rect. wooden conduit	Abandoned	Boston Harbor	
BOS055	18"x18"(U)	Salutation St. Extended	18"x18" U-shaped concrete storm drain	SW	Boston Harbor	
BOS056		Near Clark St. Extended	Sump-type regulator and tide gate chamber followed by a 36" x36" Rect. wooden conduit which is plugged.	Abandoned	Boston Harbor	

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations * and Remarks
BOS057	96"(C)	Eastern Ave. Extended	Baffle type structure followed by 96" reinf. conc. circ. conduit	SAN/SW	Boston Harbor	Hydraulic constriction caused by construction. Two 66" pipe flow to one 42" pipe
BOS058	84"(C)	Clinton Street Extended	Baffle type structure followed by 84" circ. reinf. conc. pipe	SAN/SW	Boston Harbor	
BOS059		Near State Street Extended	18" circ. vitrified clay storm drain	SAN/SW	Boston Harbor	The storm drain is not tied into the separate storm drain system along the waterfront
BOS060	72"x72"(R)	Near Central St. Extended	Baffle type structure followed by 84" circ. reinf. conc. conduit, tide gate chamber and 72" circ. reinf. conc. conduit	DWO SAN/SW	Boston Harbor	Surcharge upstream of grit chamber caused by the downstream interceptor being 2ft. higher than upstream interceptor invert.
BOS061	24"x24"(R)	Belcher Lane Extended	Sump-type regulator and tide gate chamber followed by a 24" rect. wooden conduit	SAN/SW	Boston Harbor	
BOS062	54"x72"(E)	Oliver St. Extended	Sump-type regulator and tide gate chamber followed by 54"x72" rect. reinf. conc. conduit	SAN/SW	Fort Point Channel	
BOS063	36"x36"(R)	Congress St. near Dorchester Avenue	High outlet type flow divider with a tide gate chamber followed by a 36"x36" rect. wooden conduit	SAN/SW	Fort Point Channel	
BOS064	78"x94"(R)	Summer St. near Dorchester Ave.	3 Sump-type regulators and 2 tide gate chambers followed by a 60" circ. Brick conduit	SAN/SW	Fort Point Channel	

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations* and Remarks
BOS065	81"x81"(C)	Kneeland Street Extended	Sump-type regulator and tide gate chamber followed by a 81"x81" horseshoe conduit	SAN/SW	Fort Point Channel	
BOS066	24"	North of Congress St. Bridge (West Bank)	24" circ. vitrified clay drain pipe	SW	Fort Point Channel	
BOS067	8"	Castle St. Extended	8" circ. cast iron drain pipe	SW	Fort Point Channel	Storm water from pumping station.
BOS068	72"	Near Troy St. Extended	Sump-type regulator and tide gate chamber followed by a 72" circ. reinf. conc. conduit	SAN/SW	Fort Point Channel	
BOS069	48"(C)	East Berkeley St. near Albany St.	Sump-type regulator and tide gate chamber followed by a 48" circ. reinf. conc. conduit	SAN/SW	Fort Point Channel	
BOS070	2-240"x186" (R)	Roxbury Canal Conduit near West Fourth St. Bridge.	3 sump-type regulators and tide gate chambers	SAN/SW		Some tide gate leak allowing sea water to surcharge system.

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations* and Remarks
BOS071	24"x24"(R)	West Fourth St. Bridge now connects to the Roxbury Canal Conduit	Sump-type regulator and tide gate chamber followed by a 24"x24" rect. wooden conduit	SAN/SW	Fort Point Channel	The outlet of the overflow pipe connects into the Roxbury Canal Conduit.
BOS072	60"(C)	Dorchester Ave. at Fort Point Channel	2 sump-type regulator and one tide gate chamber with a 60" circ. brick conduit	SAN/SW	Fort Point Channel	Tide gates leak during high tide.
BOS073	72"(C)	Mt. Washington Ave.	Sump-type regulator and tide gate chamber followed by a 72" circ. brick conduit	SAN/SW	Fort Point Channel	Tide gate leaks allowing sea water to enter the system during high tide.
BOS074	15"	Summer St. Bridge East Side	15" circ. vitrified clay storm drain	SW	Fort Point Channel	
BOS075	54"	Congress St. Bridge East Side	54" circ. brick storm drain	SW	Fort Point	
BOS076	84"(C)	West First St. at "F" St. Extended	4 sump-type regulators and 4 tide gate chambers followed by an 84" reinf. conc. circ. conduit	DWO SAN/SW	Reserved	1 tide gate missing. Regulator sumps plugged with flow going out the overflow.
BOS077	24"	Claflin St. Extended	24" circ. vitrified clay storm drain	SW	Reserved	
BOS078	36"x42"	Reserved Channel at "I" St. Extended	2 sump-type regulators and 1 tide gate chamber followed by a 36"x42" brick arch wood bottom conduit	SAN/SW DWO	Reserved	Tide gate does not work properly allowing sea water to surcharge the system at high tide and causing DWO.
BOS079	60"(C)	Summer St. at Reserved Channel	Sump-type regulator with 2 tide gate chambers followed by a 60" circ. brick conduit	SAN/SW	Reserved	

CHELSEA

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations * and Remarks
CHE001		Spruce St. Extended	A 96" circ. corrugated metal pipe is plugged temp. at downstream end. An 18" circ. pipe connected at the top of the 96" conduit ties into existing san. sewer system.	Abandoned	Island End River	There is a plug on the end of the 96" conduit A pumping station is planned for this overflow in the future.
CHE002	20"x30"(0)	Broadway Extended	High outlet type flow divider and tide gate chamber followed by a 20"x30" oval brick conduit	SAN/SW	Mystic River	
CHE003	10"	Winnisimmet St. Extended	10" circ. vitrified clay storm drain	SW	Chelsea River	
CHE004	72"	Pearl St. Extended	High outlet type flow divider and tide gate followed by a 72" circ. brick conduit	SAN/SW	Chelsea River	
CHE005		Shurtleff St. Extended	12"x18" oval brick storm drain which is plugged	Abandoned	Chelsea River	
CHE006		Shawmut St. Extended	12"x18" oval brick storm drain which is plugged	Abandoned	Chelsea River	
CHE007	24"	Highland St. Extended	Sump-type regulator, sand filter and tide gate chamber followed by a 24" circ. brick conduit	SAN/SW DWO	Chelsea River	Gate in the diversion manhole is shut, blocking flow from passing through the regulator pipe.
CHE008	42"	Willoughby St. Extended	Sump-type regulator and tide gate chamber followed by a 42" circ. brick conduit	SAN/SW	Chelsea River	

SOMERVILLE

NPDES Special Number	Size of Outlet	Location	Description	Composition of Discharge	Receiving Water	Observations * and Remarks
SOM006	48"(C)	Mystic Ave at Moreland St.	48" Reinf. concrete circ. storm drain	SW	Mystic River	
SOM006A	30"	Mystic Ave near Ash Ave.	storm drain	SW	Mystic River	
SOM007	42"	Shore Drive and Bailey Rd. Extended	Baffle manholes followed by a 24" circ. vitrified clay conduit	SW/PSC DWO	Mystic River	An improper connection causes a constant 3 inches of DWO to this storm drain overflow.
SOM007A	84"	Middlesex Ave. east of R.R. bridge	From pretreatment facility a 90"x120" rect. reinf. concrete conduit is followed by an 84" circ. reinf. conc. conduit	SAN/SW DWO	Mystic River	The pretreatment facility is not fully operational There is a constant DWO which is only partially treated.
SOM007B		Cresthill and Shore Drive	storm drain	SW	Mystic River	
SOM008	24"(C)	North Union St. to Mystic River	18" circ. vitrified clay conduit followed by a 24" vitrified clay conduit, followed by a 24"x24" rect. wooden conduit	SW	Mystic River	Previous connection san. sewer has been plugged. storm water overflow only.
SOM010	36"x45"(C)	Roland St. and Waverly St. Extended	Sump-type regulator and tide gate chamber followed by a 36"x45" reinf. conc. conduit and 54" circ. reinf. conc. R.R. conduit	SAN/SW	Millers' River	Tide gate missing. River flow enters the MDC Cambridge Branch Sewer at high tide.

Rectangular	(R)	Egg	(E)	Horseshoe	(H)
Circular	(C)	Modified Circular	(MC)	U-Shaped	(U)
Ovoid	(OV)	Oval	(O)		

*Observations do not reflect current operating conditions. Maintenance work has correct some of the deficiencies

PART TWO

DISCHARGES TO THE CHARLES BASIN PROJECT AREA

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES serial number	Location	Description	Composition of discharge	Receiving water	Observations and Remarks
		City of Boston				
BOS-027	027	Dunstable St. extended	Sump-type regulator and two tide gate chambers in parallel at Rutherford Avenue, followed by 72-in. by 84-in. U-shaped conc. conduit, 48-in. x 60-in. oval-shaped wooden conduit, and triple 48-in. circ. R.C. railroad culvert	SAN/SW	Millers River	18-in. connection to the MDC Charlestown Branch sewer is surcharged. One tide gate chamber bulkheaded.
BOS-028	028	Crescent St. extended	Sump-type regulator connected by 12-in. circ. conduit to tide gate chamber, followed by 36-in. R.C. conduit and railroad culvert	-	-	Overflow bulkheaded.
BOS-031	031	Parsons St. extended	Sump-type regulator and tide gate, followed by 60-in. x 60-in. rect. wooden conduit	SAN/SW	Charles River	Remainder of rotted wooden tide gates is silted shut.
BOS-032	032	North Beacon St. Extended at Birmingham Parkway	152-in. x 132-in. horseshoe brick conduit	SAN/SW	Charles River	Faneuil Valley Brook Culvert.
BOS-032A	032	Newcastle Rd. and Faneuil St.	Side outlet-type flow divider and tide gate, followed by 36-in. circ. RC conduit to Faneuil Valley Brook Culvert.	SAN/SW	Charles River	Wooden tide gate stuck open.
BOS-032B	032	Parsons St. and Faneuil St.	Transverse weir-type flow divider and tide gate, followed by 15-in. circ. VC conduit to Faneuil Valley Brook Culvert.	SAN/SW	Charles River	Overflow moved from 51-in. x 54-in. sewer to 20-in. x 26-in. sewer.
BOS-032C	032	North Beacon St. and Vineland St.	Side outlet-type flow divider, followed by 30-in. x 39-in. ovoid-shaped conduit and 36-in. circ. RC conduit to Faneuil Valley Brook Culvert.	SAN/SW	Charles River	
BOS-032D	032	Washington St. and Fairbanks St.	Side outlet-type flow divider, followed by 39-in. circ. brick conduit to Faneuil Valley Brook Culvert.	SAN/SW	Charles River	Combined sewer converted to separate sanitary; Overflow not removed.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-033	033	Arsenal St. Bridge	Sump-type regulator, followed by 30-in. x 39-in. brick conduit	SAN/SW	Charles River	
BOS-034	034	South of Cambridge St. Bridge	High point in sewer, extended as 36-in. circ. RC conduit with tide gate.	SAN/SW	Charles River	Overflow from Charles River Valley Sewer. Large deposits of oil and grease, with strong odor.
BOS-034A	-	Opposite B&M Railroad Yard	Three 36-in. circular conduits	SW	Charles River	Separate storm drains from Massachusetts Turnpike. Contaminated by oil from RR yar
BOS-035	035	Babcock St. extended	Transverse weir-type regulator and tide gate, followed by 90-in. x 84-in. horseshoe-shaped conduit.	SAN/SW	Charles River	
BOS-036	036	St. Mary's Street extended	90-in. circ. RC conduit	SAN/SW	Charles River	
BOS-036A	036	Commonwealth Ave. & St. Mary's St.	Sump-type regulator and tide gate, followed by 15 in. circ. RC conduit to 90-in. circ. RC conduit	-	-	Overflow to 90-in. circ. conduit plugged and abandoned.
BOS-036B	036	Commonwealth Ave. & St. Mary's St.	Sump-type regulator and tide gate, followed by 96-in. x 96-in. rect. brick conduit to 90-in. RC circ. conduit.	SAN/SW	Charles River	Overflow from the Brookline Main Sewer. Nozzle surcharged.
BOS-037	037	Telford St. extended	66-in. circ. conc. conduit	SAN/SW	Charles River	May receive wash water from car wash.
BOS-037A	037	Western Ave. & Everett St.	Side outlet-type flow divider, followed by 54-in. circ. conduit to 66-in. circ. conc. conduit	SAN/SW	Charles River	Overflow from 30-in. x 39-in. combined sewer.
BOS-037B	037	Western Ave. & Telford St.	Side-outlet-type flow divider, followed by 36-in. x 38-in. brick conduit to 66-in. circ. conc. conduit	SAN/SW	Charles River	Flat pipe connecting storm drain to the Charles River Valley Sewer.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
		Metropolitan District Commission				
MDC-010	010	Commonwealth Avenue and St. Mary's Street	Side outlet-type flow divider followed by 48-in. x 60-in. horseshoe-shaped brick conduit to 90-in. circ. R.C. conduit	SAN/SW	Charles River	Overflow from Charles River Valley Sewer. Overflow stop planked.
MDC-011	011	North Beacon Street extended	Side outlet-type flow divider and tide gate, followed by 152-in. x 132-in. horseshoe-shaped conduit	SAN/SW	Charles River	Tide gate jammed shut. Overflow from the Charles River Valley Sewer to the Faneuil Valley Brook Culvert.
MDC-017	017	Gordon Street extended	High outlet-type flow divider followed by 24-in. C.I. conduit	SAN/SW	Alewife Brook	Overflow from MDC Alewife Brook Pump Station.
MDC-018	018	Gloucester St. extended	High outlet-type flow divider followed by 72-in x 72-in. rect. conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit overflow
MDC-19	019	Exeter St. extended	High outlet-type flow divider followed by 72-in. x 72-in. rect. conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit overflow
MDC-20	020	Berkeley St. extended	High outlet-type flow divider followed by 84-in. x 120-in. horseshoe conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit overflow
MDC-021	021	Mt. Vernon St. extended	High outlet-type flow divider followed by 63-in. x 77-in. horseshoe conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit overflow
MDC-022	022	Cambridge St. extended	High outlet-type flow divider followed by 68-in. x 68-in. horseshoe conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit overflow
MDC-023	023	Charlesgate East extended	144-in. x 144-in. horseshoe R.C. conduit and 84-in. circ. conc. conduit	SAN/SW	Charles River	Foul Flow Conduits at MDC Fens Gatehouse
MDC-024	-	Old Charles River Dam	144-in. x 120-in. horseshoe conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit sluiceway
MDC-025A	-	Old Charles River Dam	144-in. x 120-in. horseshoe conc. conduit	SAN/SW	Charles River	Boston Marginal Conduit outfall

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
MDC-025B	-	Charles St. southwest of Leverett Circle	Sump-type regulator with tide gates to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025C	-	Charles St. at Old Poplar St.	Side outlet-type flow divider with tide gate followed by 30-in. x 36-in. wood conduit to Boston Marginal Conduit	SAN/SW	Charles River	30-in. x 36-in. local combined sewer overflow
MDC-025D	-	Charles St. at Fruit St.	Sump-type regulator with tide gates followed by 30-in. x 36-in. wood conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025E	-	Charles St. at Cambridge St.	Sump-type regulator with tide gates followed by 60-in. x 42-in. brick conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025F	-	Pinckney St. at Brimmer St.	Side outlet-type flow divider with tide gates followed by 42-in. x 20-in. brick and wood conduit to Boston Marginal Conduit	SAN/SW	Charles River	18-in. x 24-in. local combined sewer overflow
MDC-025G	-	Mt. Vernon St. at River St.	Transverse weir-type flow divider followed by 36-in. x 36-in. concrete conduit to Boston Marginal Conduit	SAN/SW	Charles River	30-in. x 30-in. local combined sewer overflow
MDC-025H	-	Mt. Vernon St. at Brimmer St.	High outlet-type flow divider followed by 36-in. x 36-in. concrete conduit to Boston Marginal Conduit	SAN/SW	Charles River	Combined sewer overflow of two local sewers
MDC-025I	-	Beacon St. at Brimmer St.	Sump-type regulator with tide gates followed by 41-in. x 53-in. brick conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025J	-	Beacon St. at Berkeley St.	Sump-type regulator with tide gates followed by 48-in. by 60-in brick conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-038	038	Larz Anderson Bridge	36-in. circ. brick conduit	SW	Charles River	Separate storm drain.
BOS-039	039	Amory St. extended	60-in. circ. CI conduit	SW	Charles River	Halls Pond Drain. Separate storm drain.
BOS-040	040	Raleigh St. & Beacon St.	Side outlet-type flow divider and tide gate, followed by 24-in. circ. conduit	SAN/SW	Charles River	Tide gate blocked shut.
BOS-041	041	Western Ave. Bridge	24-in. circ. VC conduit	SW	Charles River	Separate storm drain.
BOS-041A	-	Western Ave. Bridge	15-in. circ. conduit	SW	Charles River	Separate storm drain.
BOS-042	042	Deerfield St. extended	108-in. x 132-in. oval conduit and tide gate	SAN/SW	Charles River	Muddy River Conduit.
BOS-042A	042	Kenmore Square	Transverse weir-type flow divider and tide gate, followed by Muddy River Conduit.	SAN/SW	Charles River	Overflow from Beacon St. combined sewer to Muddy River Conduit.
BOS-042B	042	Yawkey Way & VanNess St.	Side outlet-type flow divider and tide gate, followed by 18.-in. circ. RC conduit and 51-in. circ. brick conduit to the Muddy River Conduit.	SAN/SW	Charles River	
BOS-042C	042	Fenway & Brookline Ave.	Side outlet-type flow divider to Muddy River Conduit.	SAN/SW	Charles River	
BOS-042D	042	Park Drive & Brookline Ave.	Side outlet-type flow divider to Muddy River Conduit.	SAN/SW	Charles River	
BOS-042E	042	Park Drive & Brookline Ave.	Side outlet-type flow divider to Muddy River Conduit.	SAN/SW	Charles River	
BOS-043	043	Huntington Ave. & Jamaicaway	45-in. x 45-in. U-shaped conc. conduit	SW/PSC	Muddy River	Separate storm drain with dual manholes upstream.
BOS-044	044	Opposite Aspinwall Ave.	18-in. circ. VC conduit	SW/PSC	Muddy River	Separate storm drain with dual manholes upstream.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-045	045	Vila St. extended	30-in. x 30-in. horse-shoe shaped conc. conduit	SW/PSC	Muddy River	Separate storm drain with dual manholes upstream.
BOS-046A	046	Fenway & Forsyth Way	Three 96-in. x 144-in. sluice gates	SAN/SW	Back Bay Fens	Overflow from the Old Stony Brook Conduit at Boston Gatehouse No. 2.
BOS-046B	046	Huntington Ave. & Forsyth St.	Drop inlet-type flow divider and tide gate followed by 36-in. x 48-in. brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046C	046	Huntington Ave. & Parker St.	Drop inlet-type flow divider and tide gate followed by 36-in. x 48-in. brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046D	046	Ruggles St. & Forsyth St.	Drop inlet-type flow divider and tide gate followed by 45-in. x 48-in. brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged. Tide gate rotted and stuck open.
BOS-046E	046	Whittier St. & Tremont St.	Drop inlet-type flow divider and tide gate followed by 48-in. x 32-in. brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged. Tide gate broken.
BOS-046F	046	Shawmut Ave. & Ruggles St.	Drop inlet-type flow divider and tide gate followed by 42-in. circ. conduit to the Maywood Brook Conduit.	SAN/SW	Charles River	
BOS-046G	046	Shawmut Ave. & Vernon St.	Drop inlet-type flow divider and tide gate followed by 36-in. circ. conduit to the Maywood Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-046H	046	Shawmut Ave. & Vernon St.	Side outlet-type flow divider, to the Maywood Brook Conduit.	SAN/SW	Charles River	Dry weather overflow occuring.
BOS-046I	046	Cabot St. & Vernon St.	Drop inlet-type flow divider and tide gate followed by 40-in. x 49-in. ovoid brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged.
BOS-046J	046	New Dudley St. & Elmwood St.	Side outlet-type flow divider, followed by 36-in. circ. conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	Dry weather overflow occuring. Overflow from the Stony Brook Valley Sewer.
BOS-046K	046	Tremont St. & Columbus Ave.	Side outlet-type flow divider, followed by 24-in. x 36-in. brick conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046L	046	Tremont St. & Columbus Ave.	Drop inlet-type flow divider followed by 15-in. circ. conduit to the Old Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046M	046	Fenway & Forsyth Way	Four 96-in. x 156-in. sluice gates.	SAN/SW	Back Bay Fens	Overflow from the Stony Brook Conduit to the Back Bay Fens at Boston Gatehouse No. 1.
BOS-046N	046	Huntington Ave. & Parker St.	High outlet-type flow divider and tide gate followed by 36-in. x 30-in. conduit to Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046O	046	Tremont St. & Terrace St.	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046P	046	Columbus Ave. & Cedar St.	Side outlet-type flow divider followed by 24-in. circ. conduit to West Roxbury Low Level Sewer.	SAN/SW	Charles River	Dry weather connection plugged. All flow to the West Roxbury Low Level Sewer.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-046Q	046	Columbus Ave. & New Heath St.	Side outlet-type flow divider followed by 20-in. circ. conduit to Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046R	046	Columbus Ave. & New Heath St.	Side outlet-type flow divider followed by 42-in. x 60-in. conduit to Stony Brook Conduit.	SAN/SW	Charles River	Overflow from the Stony Brook Valley Sewer.
BOS-046S	046	Centre St. & Heath St.	Side outlet-type flow divider followed by 63-in. x 19-in. conduit to Stony Brook Conduit.	SAN/SW	Charles River	Overflow from the Stony Brook Valley Sewer.
BOS-046T	046	Columbus Ave. & Centre St.	Side outlet-type flow divider followed by 24-in. circ. conduit to Stony Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged.
BOS-046U	046	Amory St. - 200 feet south of Ritchie St.	Side outlet-type flow divider followed by 18-in. x 24-in. conduit to Stony Brook Conduit.	SAN/SW	Charles River	Dry weather connection plugged.
BOS-046V	046	Ritchie St. & Columbus Ave.	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	Dry weather overflow occuring.
BOS-046W	046	Centre St. & Amory St.	Side outlet-type flow divider followed by 18-in. circ. conduit to Stony Brook Conduit.	SAN/SW	Charles River	
BOS-046X	046	Centre St. & Amory St.	Side outlet-type flow divider followed by 18-in. circ. conduit to West Roxbury Low Level Sewer.	SAN/SW	Charles River	Overflow from the Stony Brook Valley Sewer.
BOS-046Y	046	Centre St. & Amory St.	Side outlet-type flow divider followed by 24-in. circ. conduit to Stony Brook Conduit.	SAN/SW	Charles River	Overflow from the Stony Brook Valley Sewer.
BOS-046Z	046	Hoffman St. & Railroad	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-046AA	046	Hoffman St. & Railroad	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	Overflow from the West Roxbury Low Level Sewer.
BOS-046BB	046	400 ft. north of Boylston St. and Railroad	Side outlet-type flow divider to Stony Brook Conduit	SAN/SW	Charles River	
BOS-046CC	046	Boylston St. and Railroad	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	Overflow from the Stony Brook Valley Sewer Weir raised 6 in.
BOS-046DD	046	Boylston St. and Railroad	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	Weir raised 20 in.
BOS-046EE	046	Green St. and Brookside Ave.	Side outlet-type flow divider to Stony Brook Conduit.	SAN/SW	Charles River	Weir raised 10 in.
BOS-046FF	046	Green St. and Amory St.	Side outlet-type flow divider to Stony Brook Conduit	SAN/SW	Charles River	Overflow from Stony Brook Valley Sewer.
BOS-046GG	046	Washington St. and McBride St.	Side outlet-type flow divider followed by 36-in. circ. conduit to Goldsmith Brook Conduit.	SAN/SW	Charles River	Overflow from Stony Brook Valley Sewer.
BOS-046HH	046	South St. and McBride St.	Side outlet-type flow divider followed by 36-in. circ. conduit to Goldsmith Brook Conduit.	SAN/SW	Charles River	
BOS-046II	046	St. Joseph St. and Woodman St.	Side outlet-type flow divider followed by 36-in. circ. conduit to Goldsmith Brook Conduit.	SAN/SW	Charles River	
BOS-046JJ	-	Robert St. and Fairview St.	10-in. sanitary connection to storm drain	SAN/SW	Charles River	
BOS-047	047	Fenway and Worthington St.	24-in. circ. V.C. conduit	SW/PSC	Back Bay Fens	Separate storm drain with dual manholes upstream.
BOS-048	048	Kilmarnock St. extended	15-in. circ. V.C. conduit	SW/PSC	Back Bay Fens	Separate storm drain with dual manholes upstream.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
BOS-049	049	Northwest of Nashua St. extended	72-in. x 90-in. rect. RC followed by 54-in. circ R.C. conduit	SAN/SW	Charles River	Lowell St. overflow
BOS-049A	049	Bottom of off-ramp from Central Artery and Route I-93	High outlet-type flow divider and tide gate to 72-in. x 90-in. rect. R.C. conduit	SAN/SW	Charles River	
BOS-049B	049	Nassua Street	High outlet-type flow divider to 72-in. x 90-in. rect. R.C. conduit	SAN/SW	Charles River	
BOS-049C	049	Nashua St. and Causeway St.	High outlet-type flow divider to 72-in. x 90-in. rect. R.C. conduit	SAN/SW	Charles River	
BOS-049D	049	Canal St. and Causeway St.	High outlet-type flow divider to 72-in. x 90-in. rect. R.C. conduit	SAN/SW	Charles River	
		Town of Brookline				
BRO-001	-	Brook St. extended	Side outlet-type flow divider to 78-in x 66-in. oval brick conduit	SAN/SW	Muddy River	Overflow from Brookline Main Sewer.
BRO-002	-	Kent Square extended	High outlet-type flow divider to 60-in. x 66-in. rect. R.C. conduit	SAN/SW	Muddy River	Overflow from Brookline Main Sewer to Longwood Ave. Drain
		City of Cambridge				
CAM-001	001	Foch Street	High outlet-type flow divider followed by 12-in. V.C. conduit	SAN/SW	Alewife Brook	
CAM-002A	002	Massachusetts Avenue	High outlet-type flow divider followed by 30-in. conc. conduit	SAN/SW	Alewife Brook	
CAM-002B	002	Massachusetts Avenue	High outlet-type flow divider followed by 36-in. x 42-in. brick conduit	SAN/SW	Alewife Brook	
CAM-002C	002	Massachusetts Avenue	High outlet-type flow divider followed by 36-in. x 34-in. brick conduit	SAN/SW	Alewife Brook	
CAM-003A	003	Rindge Avenue Extension	Side outlet-type flow divider followed by 48-in. conduit	-	-	Overflow blocked by concrete bulkhead

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
CAM-003B	003	Rindge Avenue Extension	High outlet-type flow divider followed by 24-in. x 30-in. conc. conduit	SAN/SW	Alewife Brook	
CAM-004	004	Concord Avenue	Transverse weir-type flow divider followed by 54-in. conduit	SAN/SW	Alewife Brook	
CAM-005	005	Lowell Street extended	Transverse weir-type flow divider followed by 52-in. brick conduit	SAN/SW	Charles River	
CAM-006	006	Gibson Street extended	Transverse weir-type flow divider followed by 22-in. x 22-in. conduit	SAN/SW	Charles River	To be abandoned as tributary area is separated.
CAM-007	007 and 008	Bath Street	High outlet-type flow divider and tide gate followed by 36-in. x 48-in. rect. conc. conduit	SAN/SW	Charles River	Overflow from North Charles Relief Sewer.
CAM-009	009	Murray Street extended	Sump-type flow divider followed by 30-in. x 26-in. rect. wood conduit	SAN/SW	Charles River	Overflow blocked by bulkhead in a manhole but can be overflowed.
CAM-010	010	Dunster Street extended	Sump-type regulator and tide gate followed by 24-in. x 24-in. wood conduit	-	-	Overflow blocked by brick bulkhead
CAM-011	011	Plympton Street	48-in. circ. conduit	SAN/SW	Charles River	
CAM-011A	011	Plympton Street	High outlet-type flow divider followed by 48-in. R.C. conduit	SAN/SW	Charles River	Overflow from the North Charles Metropolitan Sewer and Plympton Street combined sewer.
CAM-011B	011	Plympton Street	Side outlet-type flow divider followed by 48-in. R.C. conduit	SAN/SW	Charles River	Overflow from North Charles Metropolitan Sewer.
CAM-011C	011	Plympton Street	Transverse weir-type flow divider followed by 48-in. x 54-in. brick conduit	SAN/SW	Charles River	Overflow from Plympton Street combined sewer.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
CAM-012	012	Hingham Street	High outlet-type flow divider (No overflow conduit exists)	-	-	There are provisions for a future 48-in. overflow from North Charles Relief Sewer.
CAM-013	013	Western Avenue	Sump-type regulator followed by 42-in. x 48-in. brick conduit	-	-	Overflow has been connected to the North Charles Metropolitan Sewer and abandoned from there to the Charles River.
CAM-014	014	Pleasant Street	Sump-type regulator and tide gate followed by 36-in. x 40-in. wood conduit	SAN/SW	Charles River	Overflow has been stop-logged but leaks.
CAM-014A	-	Pearl Street	Transverse weir-type flow divider to 42-in. circ. R.C. conduit	SW	Charles River	Low dam diverts first-flush during wet weather MDC North Charles Relief Sewer.
CAM-015	015	Talbot Street extended	24-in. x 36-in. conduit	SW	Charles River	Sanitary flow has been intercepted by the North Charles Relief Sewer and the overflow has been converted to a separate storm drain.
CAM-016	016	Massachusetts Avenue Bridge	18-in. circ. conduit	SW/PSC	Charles River	
CAM-017	017	Binney Street extended	Transverse weir-type flow divider followed by 90-in. x 96-in. wood conduit	SAN/SW	Charles River	
CAM-017A	-	Binney Street and First Street	Leaping weir-type flow divider to 96-in. x 100-in. conduit	SAN/SW	Charles River	
CAM-017B	-	Binney Street and Third Street	Leaping weir-type flow divider to 96-in. x 100-in. conduit	SAN/SW	Charles River	
CAM-017C	-	Binney Street and Fulkerson Street	Leaping weir-type flow divider to 96-in. x 100-in. conduit	SAN/SW	Charles River	
CAM-17D	-	Binney Street and Portland Street	Leaping weir-type flow divider to 90-in. x 90-in. conduit	SAN/SW	Charles River	

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
CAM-018	018	Cambridge Parkway	72-in. x 60-in. conc. conduit	SAN/SW	Charles River	Cambridge Marginal Conduit outlet.
CAM-019	019	Msgr. O'Brien Highway	Transverse weir-type flow divider followed by 96-in. x 100-in. conduit	SAN/SW	Charles River	Msgr. O'Brien Highway Storm Drain outlet.
		City of Somerville				
SOM-001	001	Woodstock Street	High outlet-type flow divider followed by 12-in. circ. conduit	SAN/SW	Alewife Brook	
SOM-001A	001	Murray Hill Road extended	Transverse weir-type flow divider followed by 54-in. x 96-in. conc. conduit	SAN/SW	Alewife Brook	Tannery Brook Storm Drain. Dry weather connection to interceptor plugged.
SOM-002	002	Powder House Blvd. extended	High outlet-type flow divider followed by 12-in. circ. conduit	SNA/SW	Alewife Brook	
SOM-002A	-	Broadway	High outlet-type flow divider followed by 12-in. cir. conduit	SAN/SW	Alewife Brook	
SOM-003	003	High Street	10-in. circ. conduit	SW/PSC	Alewife Brook	Separate storm drain with baffle manholes upstream.
SOM-004	004	Woods Avenue	10-in. circ. conduit	SW/PSC	Alewife Brook	Separate storm drain with baffle manholes upstream.
SOM-005	005	Irvington Road	12-in. circ. conduit	SW/PSC	Alewife Brook	Separate storm drain with baffle manholes upstream.
SOM-009	009	McGrath Highway	Sump-type regulator followed by 84-in. brick conduit	SAN/SW	Charles River	Overflow to Monsignor O'Brien Highway Storm Drain. Dry weather connection has been observed both free flowing and blocked.
SOM-010	010	Waverly Street extended	Sump-type regulator and tide gate chamber, followed by 36-in. x 45-in. conduit and railroad culvert	SAN/SW	Millers River	Tide gate missing, river flow enters MDC Cambridge Branch Sewer at high tide.

COMBINED SEWER OVERFLOWS, BY-PASSES, REGULATORS AND DISCHARGES IN THE CHARLES RIVER BASIN CSO STUDY AREA

Map designation	NPDES special number	Location	Description	Composition of discharge	Receiving water	Observations and remarks
MDC-025K	-	Beacon St. at Dartmouth St.	Sump-type regulator with tide gates followed by 36-in. x 48-in. brick conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025L	-	Beacon St. at Fairfield St.	Sump-type regulator with tide gates followed by 36-in. x 48-in. wood conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow
MDC-025M	-	Beacon St. at Hereford St.	Sump-type regulator with tide gates followed by 84-in. R.C. conduit to Boston Marginal Conduit	SAN/SW	Charles River	West Side Interceptor overflow

Abbreviations: SAN/SW: combined sanitary wastewater and stormwater runoff
SW/PSC: stormwater with possible sanitary connections
SW: separate stormwater

PART THREE

DISCHARGES TO THE DORCHESTER BAY PROJECT AREA

TABLE IV-2 COMBINED SEWER OVERFLOW OUTLETS WITHIN THE DORCHESTER BAY AREA

Map(1) Designation	NPDES Special Number	Location	Description(2)	Composition of Discharge	Receiving Water	Observations and Remarks
BOS-080	080	Farragut Road (extended north)	72" x 72" (U) C overflow conduit at outlet receives flow from 60" (Ø)B conduit and 30" x 36" (U)C conduit, each connected to a sump with overflow weir type regulator.	SAN/SW, DWO	Reserved Channel	Flap gate covering DWF connection stuck closed in regulator connected to 60" 8 overflow. All flow diverted to overflow.
BOS-081	081	Farragut Road (extended south)	Sump with overflow weir type regulator overflows to 15" x 20" (E) B conduit. 30" (Ø) B conduit at outlet.	SAN/SW, DWO	Old Harbor	DWF connection is blocked. All flow diverted to overflo channel.
BOS-082	082	N St. (extended)	Sump with overflow weir type regulator. 36" x 48" (E)B conduit from regulator to outlet. 48"(Ø) C.I. @ outlet.	SAN/SW	Old Harbor	Functioning properly.
BOS-083	083	K St. (extended)	Sump with high outlet type regulator overflows to 24" x 27" (OV)B conduit. 36" (Ø) C.I. conduit at outlet.	SAN/SW	Old Harbor	Functioning properly
BOS-084	084	H St. (extended)	Sump with overflow weir type regulator. Overflows to 60" (Ø)B conduit. 60" (Ø) C.I. conduit at outlet.	SAN/SW	Old Harbor	Functioning properly.
BOS-085	085	Rev. R.A. Burke St. (extended)	Sump with overflow weir type regulator overflows to 66" x 72" (MC) B conduit. Two 60" (Ø) C.I. conduits at outlet.	SAN/SW	Old Harbor	Functioning properly

TABLE IV-2 COMBINED SEWER OVERFLOW OUTLETS (cont'd)
WITHIN THE DORCHESTER BAY AREA

Map(1) Designation	NPDES Special Number	Location	Description(2)	Composition of Discharge	Receiving Water	Observations and Remarks
BOS-086	086	Kemp St. (extended)	High outlet weir type regulator. Overflows to 124" x 75" (H) B conduit. Three 60" (Ø) C.I. conduits at outlet.	SAN/SW	Old Harbor	Functioning properly.
BOS-087	087	Near Columbia Circle	120" x 120" (R) R.C. conduit receives overflow from high outlet type regulator on Dorchester Interceptor (60" (Ø) R.C.) and side overflow weir type regulator on Crescent Ave. (45" (Ø) B). Two 84" x 96" (R) R.C. conduits at outlet.	SAN/SW	Old Harbor	Functioning properly.
BOS-088	088	Malibu Beach	Side overflow weir type regulator chamber regulates CSO's. Overflows enter two 78" (Ø) R.C. conduits. Two 84" (Ø) C.I. conduits at outlet.	SAN/SW	Malibu Bay	Overflows usually only occur when high tides cause flows to back up in overflow conduit leading to Fox Point (Outlet 089).
BOS-089	089	Fox Point	Side overflow weir type regulator chamber diverts flows from Malibu Beach outlet (088) to 96" x 120" (R) R.C. conduit. Two 90" x 82" (R) R.C. conduits at outlet.	SAN/SW	Dorchester Bay	Functioning properly.
BOS-090	090	Commercial Point (near Victory Rd.)	144" x 180" (R) R.C. conduit at outlet. Collects overflows from 7 upstream regulators.	SAN/SW	Tenean Bay	Overflow collects in pond behind landfill. 36" (Ø) I pipe serves as outlet through landfill to Dorchest Bay.

[1] Same footnotes as original table.

[2] Same footnotes as original table.

PART FOUR

DISCHARGES TO THE NEPONSET ESTUARY PROJECT AREA

Neponset Estuary Study Area
Combined Sewer Overflows and NPDES-numbered Storm Outlets

NPDES No.	Location	Description	Type of Discharge	Receiving Water	Remarks
BOS-091	Ericsson St. extended	Braced closed and abandoned	-	Neponset River	
BOS-093	Neponset River Bridge	Overflow controlled by elevation and capacity of 15-inch interceptor, with regulator and tide gate chamber at Craddock Street, followed by 36-in x 48-in egg-shaped, brick conduit in Neponset Avenue, extended as 26-in x 42-in arch and scow bottom, brick and wood conduit, and tide gate chamber, followed by 48-in. circ. RC outlet conduit. 36-in. metal tide gate. Similar regulator and tide gate chamber at Walnut Street, followed by 30-in x 36-in arch and scow bottom, brick and wood conduit extending in Taylor Street to upstream end of 36-in x 42-in conduit mentioned above. 30-in. metal tide gate.	SAN/SW DWO	Neponset River	Included in 1972 tide gate rehabil tation program - continuous dischai at low tide
BOS-094	Hallet St. at Davenport Brook	Overflow controlled by 12-inch interceptor in trunk sewer invert, with regulator and tide gate chamber at Fuller Street near Clermont Street, followed by 54-in. cir. brick, 48-in. circ. RC, 84-in x 90-in. rect. RC, 88-in x 90-in rect. RC, 66-in x 132-in. rect. RC, and two 74-in x 93-in rect. RC conduits. High level overflow and tide gate chamber at Adams Street near Minot Street, connected directly to outlet conduit described above. One 24-in. metal tide gate. Overflow on interceptor in Hallet Street near end of outlet bricked-up and abandoned (by City, 1972).	SAN/SW	Dav.Brook/ Neponset River	Principal drainag conduit for the study area; occasional CSO fron 2 upstream regula tors

Neponset Estuary Study Area
Combined Sewer Overflows and NPDES-numbered Storm Outlets

NPDES No.	Location	Description	Type of Discharge	Receiving Water	Remarks
BOS-096	Neponset River Granite Avenue	Overflow controlled by 20-inch interceptor in trunk sewer invert, with regulator connected by inverted siphon to tide gate chamber, followed by 36-in x 48-in. egg-shaped brick conduit. 36-in. metal tide gate.	SAN/SW	Neponset River	Ocassional DWO due to regulator blockage - included in 1972 tide gate program
BOS-100	Mellish Rd. extended	24 x 34-inch storm drain	SW	Neponset River	Designated as CSO in permit although maps and site indicate it to be a separate storm outlet
BOS-95	Hilltop and Lenoxdale St.	36-inch storm drain	SW	Neponset River	-
BOS-101	Bearse Avenue extended	15-inch storm drain	SW	Neponset River	-
BOS-102	Adams Street at Neponset River	24 x 36-inch storm drain	SW	Neponset River	-
BOS-103	East of Central Avenue Bridge	30-inch storm drain	SW	Neponset River	-

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